

CUMBERLAND RIVER AUTHORITY

THIRD

Annual Report

for the

YEAR ENDED 31st MARCH, 1968

NOTE

The Cumberland River Authority Area is the same as that of the former Cumberland River Board. The Authority's constitution is governed by The Cumberland River Authority Constitution Order, 1964 (S.I. 1964 No. 1014).

Cumberland River Authority

Third

ANNUAL REPORT

for the

YEAR ENDED 31st MARCH, 1968

Chairman of the Authority:
Major C. S. R. GRAHAM.

Vice-Chairman:
R. TOWNSLEY, ESQ., (To November 1967)
P. J. LIDDELL, ESQ., D.S.C., M.A., (From November, 1967)

256. London Road,
CARLISLE,
Cumberland.
Telephone: Carlisle 25151/2

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Part I

General

Chairman of the Authority :

Major C. S. R. GRAHAM.

Vice-Chairman :

R. TOWNSLEY Esq. (to November 1967)

P. J. LIDDELL, Esq. (from November 1967)

Members of the Authority:

A. Appointed by Local Authorities under Section 6 (2) and 7 of the Act:

(i) Cumberland County Council. Hawskdale Hall, Dalston, Carlisle.
E. H. Fleming Smith Esq., T.D.,
J.P., F.R.I.C.S., F.L.A.S.,

Commander F. M. Fox, O.B.E., Fawe Park, Keswick, Cumberland.
A.F.C., V.R.D., R.N.V.R., (Ret.)
(To November 1967)

L. Highton, Esq., J.P., D.L., High Barn, Rogerscale, Cockermouth,
(From January 1968) Cumberland.

J. O. Holliday, Esq., J.P., The Gale, Silloth, Cumberland.
(From November 1967)

N. F. Hudleston, Esq., Hutton John, Dacre, Penrith,
Cumberland.

(a) W. Jackson Esq., Greensyke, Houghton, Carlisle.

(b) C. F. Johnston Esq., "Stonygarth", Pallaflat, Bigrigg,
(From July 1967) Egremont, Cumberland.

(c) W. E. Knipe, Esq., "Ridgeways", Loop Road South,
Whitehaven, Cumberland.

(d) M. P. Nilsson, Esq., M.B.E., J.P., "Burcot", Newlands Lane,
(From March 1968) Workington, Cumberland.

(b) T. J. Rawling, Esq., "Overdale", Linethwaite, Moor Row,
(To July 1967) Cumberland.

(d) R. Townsley, Esq., 12, Roper Terrace, Salterbeck,
(To January 1968) Workington, Cumberland.

W. Walker, Esq., J.P., Greenlands, Holmrook, Cumberland.
(To November 1967)

J. Westoll, Esq., J.P., D.L., Dykeside, Longtown, Cumberland.

(ii) Westmorland County Council.

| | |
|--|---|
| Capt. The Hon. A. G. Lowther, M.B.E., D.L., | Whitbysteads, Askham, Penrith, Cumberland. |
|--|---|

(iii) Carlisle County Borough Council.

| | |
|---|--|
| I. Burrow, Esq., (To November 1967) | 31, Lamb Street, Upperby, Carlisle. |
| R. D. Harrison, Esq., (From November 1967) | Ladywood, Dalston, Carlisle. |
| H. Little, Esq., | 31, Marina Crescent, Currock, Carlisle. |
| Capt. C. N. Matthews, M.B.E., J.P., D.L. | Little Bank, Stanwix, Carlisle. |

B. Appointed by the Minister of Agriculture, Fisheries and Food:—

(i) under Section 6 (3) (a) — Representing Land Drainage:—

| | |
|-------------------------------|--|
| Major C. S. R. Graham, | Crofthead, Longtown, Cumberland. |
| W. H. W. Roberts, Esq., J.P., | Boothby, Brampton, Cumberland. |
| J. R. Slack, Esq., | Mealo House, Allonby, Maryport, Cumberland. |

(ii) under Section 6 (3) (b) — Representing Fisheries:—

| | |
|------------------------------------|---|
| W. G. Dawson, Esq., | 44 Ashley Street, Carlisle. |
| P. J. Liddell, Esq., D.S.C., M.A., | Moorhouse Hall, Warwick-on-Eden, Carlisle. |
| J. C. Wade, Esq., O.B.E., J.P., | Hillcrest, Inkerman Terrace, Whitehaven, Cumberland. |

(iii) under Section 6 (3) (c) — Representing Agriculture:—

| | |
|--------------------|-------------------------------|
| T. W. Pears, Esq., | Woodlea, Nealhouse, Carlisle. |
|--------------------|-------------------------------|

C. Appointed by the Minister of Housing and Local Government:—

(i) under Section 6 (3) (d) — Representing Public Water Supply:—

| | |
|--|---|
| R. L. Harrison, Esq., B.Sc., (Eng.) M.I.C.E., M.I.W.E., | 2, Dawlish Avenue, Lynton Park, Cheadle Hulme, Cheshire. |
| D. G. Milroy, Esq., M.Eng. M.I.C.E., M.I.W.E., | Kingfields, 64 Langrigg Road, Morton, Carlisle. |
| W. A. Walker, Esq., J.P. | Croft House, Elizabeth Street, Workington, Cumberland. |

(ii) under Section 6 (3) (e) — Representing Industry other than
Agriculture:—

| | |
|------------------------|---|
| W. B. Baker, Esq., | “Windyridge”, Little Salkeld, Langwathby, Penrith, Cumberland. |
| A. C. Halfpenny, Esq., | “Cartgate”, Hensingham, Whitehaven, Cumberland. |

(a) Appointed on the nomination of Border Rural District Council.

(b) Appointed on the nomination of Ennerdale Rural District Council.

(c) Appointed on the nomination of Whitehaven Borough Council.

(d) Appointed on the nomination of Workington Borough Council.

It is with deep regret that the Authority records the death, in January, 1968, of Mr. R. Townsley and wishes to place on record an appreciation of his services. Mr. Townsley was Vice-Chairman of the Authority from its first Meeting in 1964 until November 1967 when he declined re-appointment because of ill-health. He was a member of the former Cumberland River Board from 1955 to 1965 and gave many years voluntary service to a variety of public bodies.

During the year Mr. P. J. Liddell, Vice-Chairman and Chairman of the Fisheries and Water Recreation Committee, was awarded a Churchill Fellowship by the Winston Churchill Memorial Trust to enable him to study fishery problems and research in connection with Atlantic Salmon. He will be visiting the United States of America, Canada, and some European countries as part of his investigations and tireless efforts in the interest of salmon conservation.

COMMITTEES

FINANCE AND GENERAL PURPOSES COMMITTEE

Chairman:

Wilfred H. W. Roberts, Esq.,

Vice-Chairman:

J. R. Slack, Esq.

Commander F. M. Fox
(To November, 1967)
A. C. Halfpenny, Esq.,
L. Highton, Esq.,
(From February, 1968)
N. F. Hudleston, Esq.,
(From November, 1967)
W. Jackson, Esq.
C. F. Johnston, Esq.,
(From July, 1967)
P. J. Liddell, Esq.,
(To November, 1967)

H. Little, Esq.
Capt. The Hon. A. G. Lowther.
Capt. C. N. Matthews.
D. G. Milroy, Esq.
T. J. Rawling, Esq.,
(To July, 1967)
E. H. Fleming Smith, Esq.
J. C. Wade, Esq.
W. A. Walker, Esq.
J. Westoll, Esq.
(To January, 1968).

The Chairman and Vice-Chairman of the Authority and the Chairman of each Standing Committee (ex-officio).

WATER RESOURCES COMMITTEE

Chairman:

Major C. S. R. Graham.

Vice-Chairman:

R. Townsley, Esq., (To November 1967)
P. J. Liddell, Esq., (From November 1967).

W. B. Baker, Esq.
I. Burrow, Esq.,
(To November, 1967)
W. G. Dawson, Esq.,
(From February, 1968)
A. C. Halfpenny, Esq.
R. D. Harrison, Esq.,
(From November, 1967)
R. L. Harrison, Esq.
L. Highton, Esq.,
(From February, 1968)
N. F. Hudleston, Esq.
W. Jackson, Esq.
C. F. Johnston, Esq.,
(From July, 1967)

W. E. Knipe, Esq.
P. J. Liddell, Esq.,
(To November, 1967)
Capt. The Hon. A. G. Lowther.
Capt. C. N. Matthews.
D. G. Milroy, Esq.
T. J. Rawling, Esq.,
(To July, 1967)
J. R. Slack, Esq.
E. H. Fleming Smith, Esq.
J. C. Wade, Esq.
W. A. Walker, Esq.
J. Westoll, Esq.,
(To January, 1968)

Co-opted Members:

| | |
|--|--|
| A. Helme, Esq., (To November, 1967) | Brougham Hall Farm, Penrith, Cumberland. |
| Major E. Thompson, O.B.E., F.L.A.S. | Rosetrees, Lingholm, Keswick, Cumberland. |

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance and General Purposes Committee (ex-officio).

LAND DRAINAGE COMMITTEE

Chairman:

J. R. Slack, Esq.

Vice-Chairman:

W. Jackson, Esq.

| | |
|--|--|
| I. Burrow, Esq., (To November, 1967) | J. O. Holliday, Esq., (From November, 1967) |
| W. G. Dawson, Esq., | Capt. The Hon. A. G. Lowther |
| N. F. Hudleston, Esq., | T. W. Pears, Esq., |
| W. E. Knipe, Esq., | W. Walker, Esq., |
| R. D. Harrison, Esq., (From November, 1967) | (To November, 1967) |

Co-opted Member:

Major E. Thompson.

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance and General Purposes Committee (ex-officio).

FISHERIES AND WATER RECREATION COMMITTEE

Chairman:

P. J. Liddell, Esq.

Vice-Chairman:

Commander F. M. Fox (To November 1967)

J. C. Wade, Esq., (From November 1967)

| | |
|--|---|
| W. B. Baker, Esq., | Capt. The Hon. A. G. Lowther, |
| W. G. Dawson, Esq., | Capt. C. N. Matthews, |
| L. Highton, Esq., (From January, 1968) | E. H. Fleming Smith, Esq., |
| J. O. Holliday, Esq., (From November, 1967) | J. R. Slack, Esq., (From February, 1968) |
| | J. Westoll, Esq. |

Co-opted Members

| | |
|---|---|
| J. G. Milne Home, Esq., | Irvine House, Canonbie, Dumfriesshire. |
| W. W. Routledge, Esq., F.C.A., | "Knightstone", 24 Bampton Road, Carlisle. |
| Colonel N. A. Stanley, D.S.O., O.B.E., | Dalegarth Hall, Eskdale, Cumberland. |
| E. B. Totty, Esq., | "Craigmuir", High Knott Road, Arnside, Via Carnforth, Lancs. |

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance and General Purposes Committee (ex-officio).

POLLUTION COMMITTEE

Chairman:

E. H. Fleming Smith, Esq.,

Vice-Chairman:

W. Jackson, Esq.,

W. B. Baker, Esq.,
Commander F. M. Fox,
(To November, 1967)
P. J. Liddell, Esq.,
(To November, 1967)
H. Little, Esq.,
M. P. Nilsson, Esq.,
(From March, 1968)

T. W. Pears, Esq.,
J. R. Slack, Esq.,
R. Townsley, Esq.,
(To January, 1968)
J. C. Wade, Esq.,
(From February, 1968)

The Chairman and Vice-Chairman of the Authority and the
Chairman of the Finance and General Purposes Committee (ex-officio).

Representatives on other bodies:

Association of River Authorities:

Major C. S. R. Graham.
P. J. Liddell, Esq.
J. R. Slack, Esq.

Cumberland Sea Fisheries Committee:

W. G. Dawson, Esq.

PART II
PARTICULARS OF STAFF
(as at 31st March, 1968)

1. CHIEF OFFICERS

| | |
|---|---|
| Clerk of the Authority and Financial Officer | RALPH BIRKETT, F.C.C.S. |
| Chief Engineer | A. J. COLLINS, B.Sc., A.M.I.C.E., A.M.I.W.E. |
| Chief Pollution Officer | H. J. SMITH, M.Inst.W.P.C., M.R.S.H. |
| Fishery Officer | N. MACKENZIE, F.Z.S.A.Inst.W.P.C. |

2. OTHER OFFICERS

Clerk's Department

| | |
|---------------------------------------|-----------------------------------|
| 1 Deputy Clerk and Financial Officer | Senior Officers' Grade |
| 1 Chief Clerk | A.P. IV/V |
| 1 Rating Assistant | A.P. Grade III |
| 1 Accountancy Assistant | A.P. Grade III |
| 1 Accountancy Assistant | Clerical Grade I/II |
| 1 Inspector—Water Resources Act ... | Tech. Grade 5 |
| 1 Collector/Clerical Assistant | Clerical I |
| 1 Shorthand Typist | Shorthand Typists' Senior Scale A |
| 2 Shorthand Typists | Shorthand Typists' Scale |
| 1 Copy Typist/Clerk | Copy Typists' Scale |

Engineer's Department

| | |
|--|----------------------------------|
| 1 Deputy Engineer | Principal Officers Scale Range I |
| 1 Chief Assistant Engineer (Hydrologist) | Principal Officers Scale Range I |
| 1 Assistant Engineer (Hydrologist) ... | Senior Officers' Grade |
| 1 Assistant Engineer (Hydrological Department) | A.P. Grade III |
| 1 Assistant Hydrologist | A.P. Grade III (Vacant) |
| 1 Assistant Engineer (River Gauging) | A.P. Grade III/IV |
| 1 Land Surveyor (Water Resources) | Tech. Grade 4 |
| 1 Hydrometric Assistant | Tech. Grade 3 |
| 2 Assistant Engineers (Land Drainage) | A.P. Grade III/IV |
| 1 Draughtsman/Surveyor | Tech. Grade 2 |
| 1 Surveying Assistant | A.P. Trainee Grade |
| 1 Records Clerk | Clerical Grade I |
| 1 Shorthand Typist | Shorthand Typists' Scale |
| 1 Clerk | Clerical Grade I |

Pollution Prevention Department

| | |
|--------------------------------------|--------------------|
| 1 Assistant Pollution Officer | A.P. III/IV |
| 1 Junior Assistant | A.P. Trainee Grade |
| 1 Assistant Chemist | A.P. IV/V |

Fisheries Department

| | |
|------------------------------------|-------------|
| 1 Assistant Fishery Officer | A.P. III/IV |
| 1 Fisheries Inspector | A.P. II/III |

3. WATER BAILIFFS

13 Water Bailiffs (Full-time)
47 Honorary Bailiffs (unpaid)

4. LABOUR FORCE

1 Hydrometric Foreman
5 Land Drainage Foremen
50 Workmen

PART III

INFORMATION AS TO WATER RESOURCES

SECTION I. GENERAL REVIEWS

During the twelve months under review the work has largely been of a routine character without any critical decisions becoming necessary or made. Applications for new licences to abstract have been received and dealt with, involving detailed investigation and consideration. Work concerned with the enforcement of licence conditions has been done and there have been prosecutions for contravention of such conditions.

In the second part of the year much work was put into the preparation of a Charging Scheme, meetings being held with the local committees of the British Waterworks Association and the Confederation of British Industry.

Progress with the construction of new gauging stations has been rather slower than had been hoped. One station which was started in the previous year was completed, three more were commenced and completed and on another, work was in progress at the end of the year; all these were current meter stations. At the same time good progress has been made with the general work of rating existing stations and maintaining the rating curves through changes of stream section and in some cases of control. A large programme of gauging at sites other than those of the regular gauging stations has been carried through; in particular on the smaller streams and in times of low flow. Good progress has also been made in the conversion of staff gauges and recorders to metric units, this work being practically complete at the end of the year.

Manchester Corporation commenced work during the year on their Ullswater Scheme.

The West Cumberland Water Board had in progress during the year work in connection with their Third Crummock Supply by which they will be able to take an extra 4—5 million gallons per day from Crummock Water, dependant on the provision of the specified quantity of compensation water to the River Cocker.

The South Cumberland Water Board decided to proceed with the augmentation of the supply of water from Ennerdale Lake, increasing the abstraction from 8 million gallons per day to 14 million gallons per day for which they have existing powers. The Water Board also decided that this could be done without raising the level of the lake. This has led to considerable anxiety about the effect on the flow in the River Ehen. It is, however, hoped that discussions with the Water Board may lead to beneficial adjustments of the compensation flows.

The Authority had under consideration the need to provide extra water for industry in West Cumberland. The assessment of this need has been very difficult and there appears to be some divergence of opinion as to whether it would be wise to encourage large water using industries to come to this part of Cumberland. This is a development area and the Authority realises that the provision of abundant water could be of paramount importance. With this in mind a decision was made to proceed with the investigation into the possible methods of augmenting the flow of the River Derwent.

The Northern Technical Working Party set up by the Water Resources Board and of which the Chief Engineer is a member, continued their investigations into the demand for water and the water resources in the North of England. The final report on the water resources of the North is expected during the coming year.

SECTION 2. PERIODICAL SURVEYS.

The Water Resources Board have intimated that the first survey required under Section 14 of the Water Resources Act 1963, should be completed by the 30th September 1969. Some work has already been done on this survey by the Authority's Consulting Engineers, Messrs. R. H. Cuthbertson & Associates, Edin-

burgh; this work will be continued through the coming year by the Consulting Engineers together with Members of the Authority's Hydrological Staff.

SECTION 3. HYDROMETRIC SCHEMES

At the 31st March, 1968, the following gauging stations were in operation:—

| | | | | | |
|---------------------------------|-----|-----|-----|------------------|-----|
| River Eden—Sheepmount, Carlisle | ... | ... | ... | Grid Ref: NY/390 | 571 |
| River Eden—Warwick Bridge | ... | ... | ... | Grid Ref: NY/471 | 567 |
| River Eden—Temple Sowerby | ... | ... | ... | Grid Ref: NY/604 | 283 |
| River Derwent—Camerton | ... | ... | ... | Grid Ref: NY/037 | 305 |
| River Derwent—Ouse Bridge | ... | ... | ... | Grid Ref: NY/198 | 321 |
| River Esk (Border)—Netherby | ... | ... | ... | Grid Ref: NY/390 | 718 |
| River Irthing—Greenholme | ... | ... | ... | Grid Ref: NY/487 | 583 |
| River Eamont—Udford | ... | ... | ... | Grid Ref: NY/575 | 305 |
| River Lowther—Eamont Bridge | ... | ... | ... | Grid Ref: NY/525 | 285 |
| River Irt—Strands | ... | ... | ... | Grid Ref: NY/130 | 038 |
| River Cocker—Southwaite | ... | ... | ... | Grid Ref: NY/131 | 281 |

The following gauging station was under construction:—

| | | | | | |
|------------------------|-----|-----|-----|------------------|-----|
| River Caldew—Holm Hill | ... | ... | ... | Grid Ref: NY/378 | 467 |
|------------------------|-----|-----|-----|------------------|-----|

All these are current meter stations with continuous water level recording by both autographic and punched tape recorders. The punched tapes from all these gauging stations are passed to the Water Resources Board for processing.

It was hoped to have instruments installed for the climatological stations. This has, however, been deferred until suitable instruments are tested and available. In this connection a close contact was maintained with the Hydrological Research Unit at Wallingford who have done a good deal of development work.

SECTION 4. INVESTIGATION OF WATER IN UNDERGROUND STRATA

Investigations of water in underground strata have been confined to the south-west of the area. Further consideration was given to the possibility of obtaining reliable supplies from the old iron ore mines in West Cumberland, but it was finally decided that the supply of water from this source was uncertain, that much of the water was derived from surface sources which could be depleted by taking water from underground, and that the quality of such water was certainly suspect.

It seemed that a much more likely source of water would be the triassic sandstones south of Whitehaven. The geological Section of the Water Resources Board have collaborated with the Authority's hydrological department and have decided where test borings could be made with some confidence of success. It was intended to prepare a scheme under Section 18 of the Water Resources Act and to submit this to the Water Resources Board for approval.

SECTION 5. MINIMUM ACCEPTABLE FLOWS

Consideration has been given to the assessment of a minimum acceptable flow for the River Derwent, but at the end of the period under review no definite conclusions had been reached. The Authority has not submitted any draft statement under Section 19 of the Water Resources Act.

SECTION 6. RESEARCH & EXPERIMENTAL WORK

A description was given in the last Annual Report of the Coal Burn experimental catchment study. This is situated in the Upper Catchment of the River Irthing and has been commenced by the Hydrological Research Unit of the National Environment Research Council for the purpose of measurement of storm run-offs and the relationship with rainfall for various degrees of afforestation from a virgin area to full tree growth. The study is being serviced by the Authority and is now in full operation.

SECTION 7. LICENCES

(a) Abstraction Licences

Summary of Licences granted during the year and licences revoked or lapsed up to 31st March, 1968. The quantities are stated in thousands of gallons:—

| Category | Granted | | Revoked etc. | |
|---|---------|----------|--------------|----------|
| | No. | Quantity | No. | Quantity |
| Public Water Supply | 2 | 497,860 | 6 | 40,880 |
| Industrial (Others) | 21 | 579,658 | 12 | 146,805 |
| Agriculture (other than spray irrigation) | 3 | 1,980 | 8 | 3,432 |
| Miscellaneous | 9 | 84,664 | 2 | 850 |

Variations were made to eight licences. These increased the annual licensed quantities for industry by 50,440,000 gallons, public water supply by 4,000,000 gallons and miscellaneous by 23,000 gallons.

(b) Impounding Licences.

No licences were issued during the year.

SECTION 8. CONSERVATION WORKS

The Authority have been much concerned with the necessity to augment the flow of the River Derwent. As reported in the last Annual Report the Authority's Consulting Engineers—Messrs. R. H. Cuthbertson & Associates of Edinburgh—presented a report in February 1967. In this it was recommended that consideration should be given to a limited control of Bassenthwaite Lake together with the provision of a tidal weir at Workington. The possibilities of using one of the tributary valleys of the River Derwent as a regulating reservoir was also suggested.

A meeting was held in June with representatives of local authorities, Ministries, and other interested bodies when the report was discussed and reactions noted.

The Authority decided to instruct the Consulting Engineers to proceed with the necessary site investigations and surveys and at the same time consider the possibilities of a regulating reservoir on the River Caldew and the use of water therefrom to augment the flow of the River Derwent.

Subsequently contracts were let for trial boring, seismic surveys and aerial surveys. This work was still in progress at the end of the period under review, but it was expected that Messrs. R. H. Cuthbertson & Associates would be in a position to give a full report with definite recommendations by the summer of 1968.

SECTION 9. AGREEMENTS UNDER SECTION 81 AND ORDERS UNDER SECTION 82

Section 81—None.

Section 82—None.

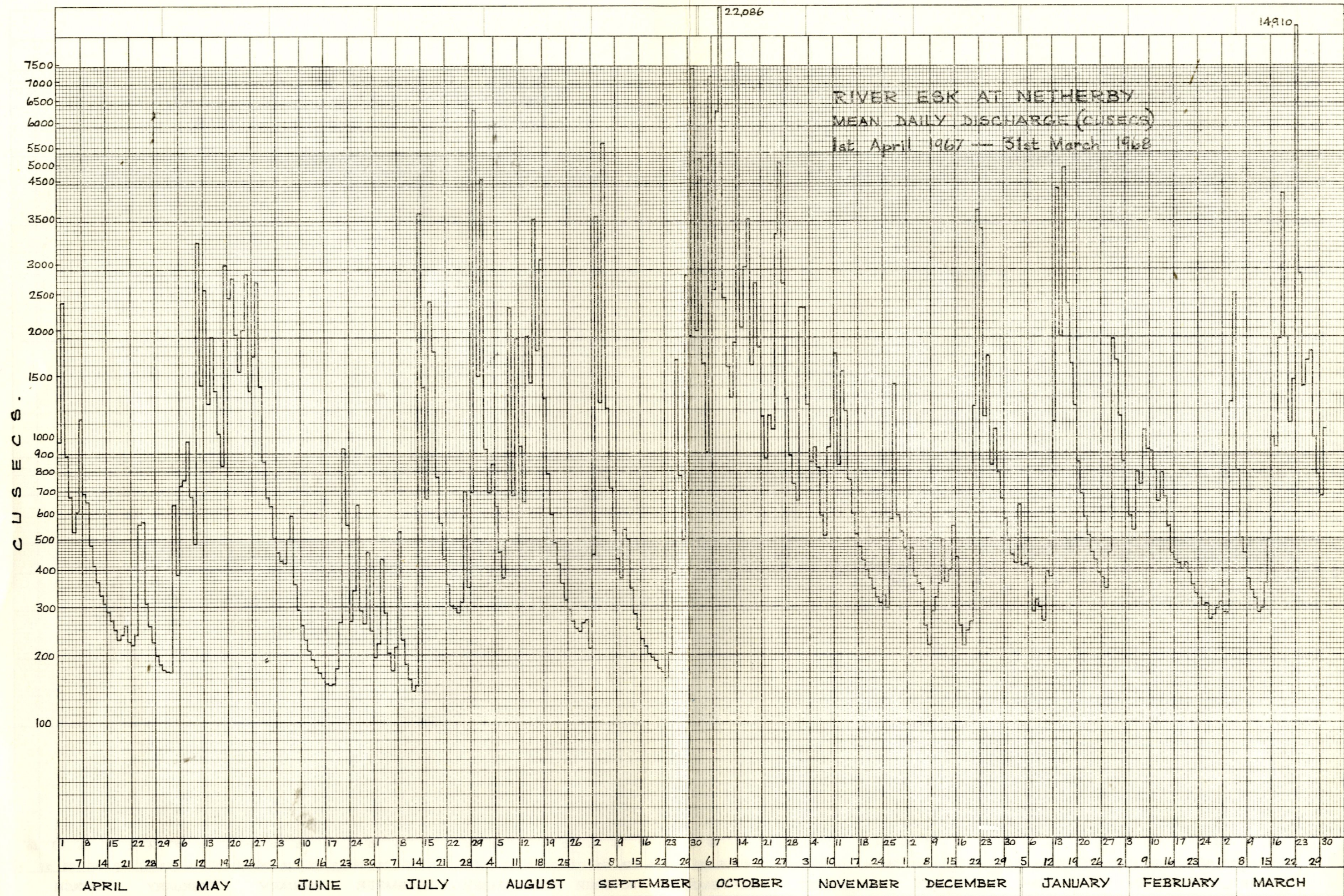
SECTION 10. RECREATIONAL FACILITIES.

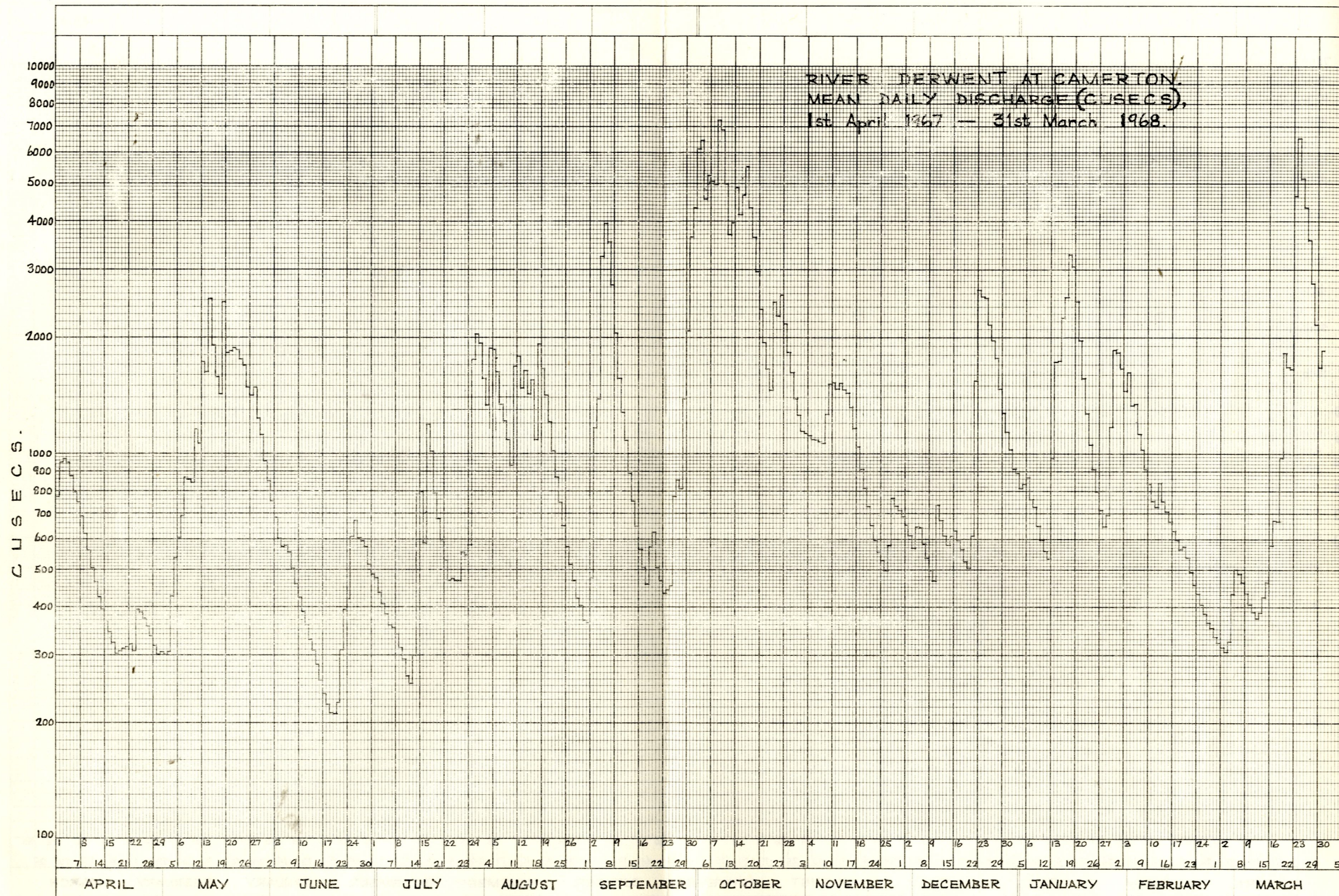
No reservoir or lake is owned or managed by the Authority.

SECTION 11. CHARGES

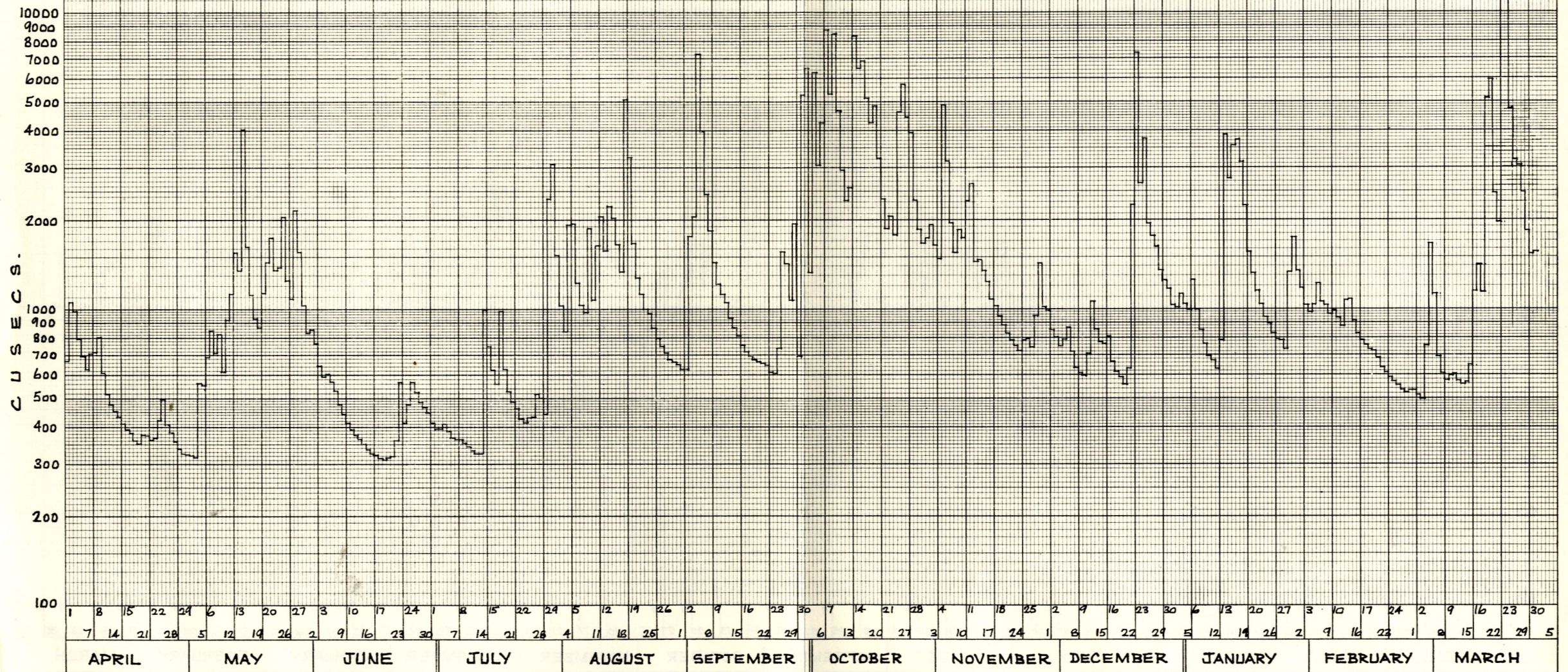
Details of the Interim Charging Scheme under Section 62 of the Water Resources Act, 1963, were included in the Annual Report for the year ended 31st March, 1967. The basic rate of charge for 1967/68 remained at $\frac{1}{4}$ d. per 1,000 gallons.

The Authority prepared a Charging Scheme under Section 58 of the Act and this was submitted to the Ministry of Housing and Local Government in February 1968. A number of objections were made against the Scheme and no decision had been given by the end of the year.

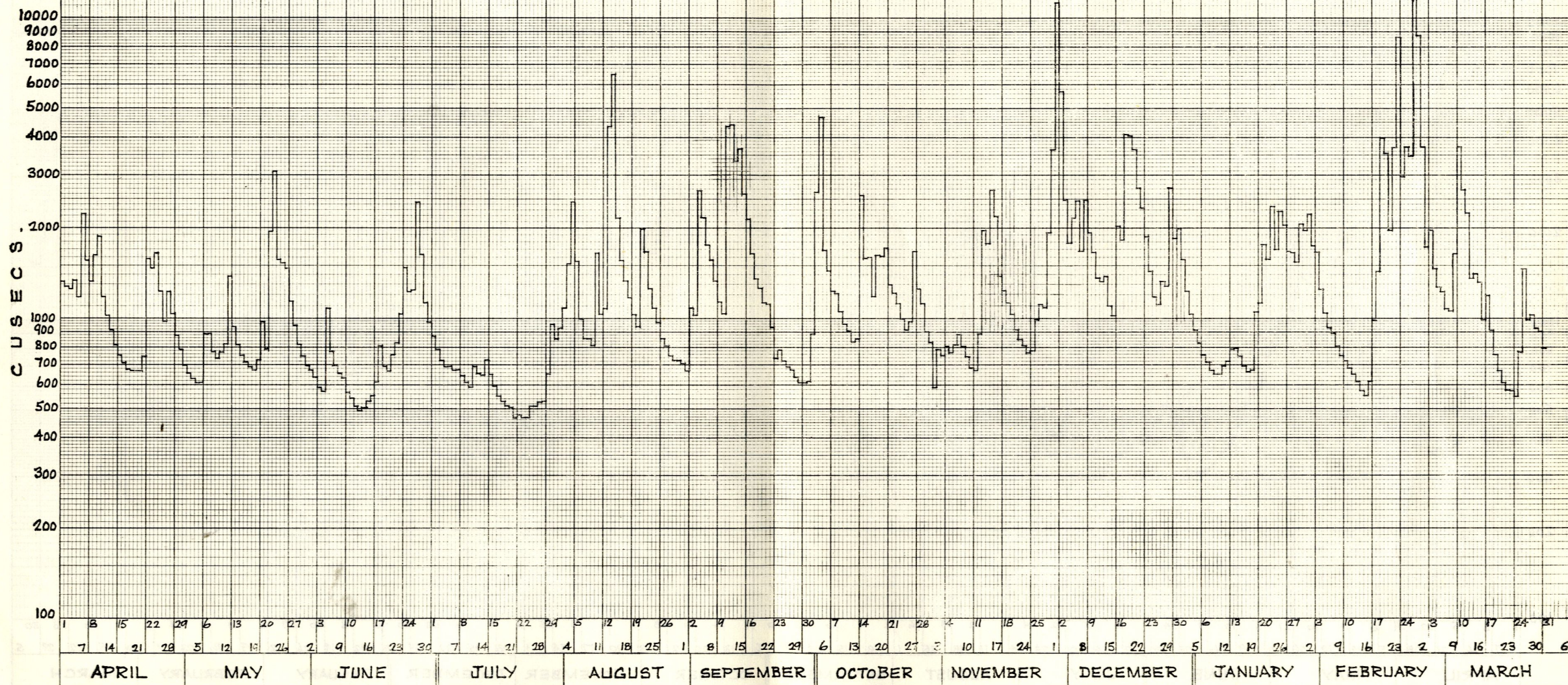




RIVER EDEN AT WARWICK BRIDGE
 MEAN DAILY DISCHARGE (CUSECS)
 1st April 1967 — 31st March 1968.



RIVER EDEN AT WARWICK BRIDGE
 MEAN DAILY DISCHARGE (CUSECS)
 1st April 1966 — 31st March 1967.



SECTION 12. GENERAL REVIEW OF RAINFALL & RIVER FLOW

The total rainfall for the twelve months ending 31st March, 1968, was above the average; this being the third successive period of twelve months with above average rainfall. During the year ending 31st December 1967, the average rainfall over a great part of the area was 120% of the 1916—1950 average with portions having an excess of more than 30%. May was exceedingly wet so that most reservoirs were overflowing at the beginning of the summer. September and October were also months of heavy rain. There were no dry months; the longest dry spell being in the second half of June. April 1967 was also fairly dry as was February 1968. As a result of the amount and incidence of rainfall, river levels were rarely low and for long periods bank full conditions were experienced. Floods were general in October with severe flooding generally on the 17th.

Following the longer dry spell in February and early March rain occurred in the third week in March culminating in very heavy rain on the 22nd and 23rd particularly in the Upper Eden Catchment. This rain together with a rapid melt of snow on the higher fells caused a rapid rise in the River Eden which resulted in the most severe floods in the Eden Valley for very many years.

The Floods experienced during the year are described in detail in Part IV, Section 4.

Graphs are appended showing river flows in the River Derwent at Cameron, the River Esk at Netherby and the River Eden at Warwick Bridge for the year ending 31st March, 1968. Also appended is a graph showing the flow in the River Eden at Warwick Bridge for the year ending 31st March, 1967. It was not possible to include this in the Second Annual Report because of difficulties with the stage-discharge curve.

RAINFALL AT SELECTED STATIONS APRIL 1967—MARCH 1968

| | Hutton John | Newton Rigg | Longtown | Temple Sowerby | Patterdale Hall | Reunwick | Appleby Castle | Skelton |
|--------------------|-------------|-------------|----------|----------------|--------------------|----------|-------------------|---------|
| 1967 | | | | | | | | |
| APRIL | 1.15 | 0.84 | 1.17 | 1.04 | 1.97 | 1.92 | 1.18 | 0.98 |
| MAY | 8.24 | 6.63 | 5.21 | 4.68 | 11.56 | 5.04 | 3.89 | 6.15 |
| JUNE | 3.25 | 3.11 | 2.16 | 1.13 | 3.38 | 2.09 | 1.35 | 2.15 |
| JULY | 3.94 | 3.41 | 4.39 | 3.13 | 6.51 | 4.51 | 3.30 | 3.02 |
| AUGUST | 4.48 | 3.71 | 4.63 | 5.24 | 5.93 | 4.70 | 4.05 | 3.92 |
| SEPTEMBER | 7.22 | 4.77 | 4.06 | 4.02 | 11.50 | 3.71 | 2.08 | 4.31 |
| OCTOBER | 13.31 | 9.49 | 8.09 | 7.14 | 24.35 | 9.78 | 8.41 | 9.79 |
| NOVEMBER | 2.83 | 2.20 | 2.23 | 2.90 | 4.21 | 3.62 | 2.80 | 1.93 |
| DECEMBER | 3.85 | 2.62 | 1.70 | 2.16 | 4.94 | 3.43 | 2.73 | 2.70 |
| 1968 | | | | | | | | |
| JANUARY | 3.90 | 2.63 | 2.70 | 2.10 | 6.86 | 3.16 | 2.41 | 2.76 |
| FEBRUARY | 2.25 | 1.25 | 1.28 | 1.12 | 2.91 | 1.93 | 1.61 | 1.30 |
| MARCH | 7.07 | 5.57 | 3.78 | 4.33 | 13.27 | 3.92 | 5.53 | 5.25 |
| YEAR'S TOTAL | 61.49 | 46.23 | 41.40 | 38.99 | 97.39 | 47.81 | 39.34 | 44.26 |
| AVERAGE | 48.32 | 35.09 | 33.97 | 32.89 | 90.63 | 39.11 | 36.62 | 37.90 |
| YEARS OF RECORD | + 60 | + 60 | 21 | 22 | 7 | 22 | 23 | 8 |

PART IV

LAND DRAINAGE

SECTION 1. CAPITAL WORKS

(i) GRANT AIDED IMPROVEMENT SCHEMES IN PROGRESS DURING THE YEAR

(a) RIVER WAMPOOL PART III

Work on this scheme, for the improvement of $2\frac{3}{4}$ miles of the River Wampool between Micklethwaite and Crofton was completed in September at a cost of £10,660, a supplementary estimate of £1,152 having been approved for grant-aid in August. In October, shortly after the work was completed, a succession of abnormal floods occurred which caused severe damage to several lengths of bank. The Ministry's Regional Engineer was prepared to recommend that grant-aid should be given for the necessary remedial work and subsequently an estimate of £2,977 was approved. Remedial work commenced during March, this being the earliest opportunity because of bad site conditions.

(b) RIVER CALDEW (CARLISLE)

Work on this scheme was finally completed in July at a total cost of £5,041. Scour which had commenced round the footings of the piers of South Vale Foot-bridge, at the upstream end of the scheme, was caused by an increased flow velocity through the bridge induced by an accumulation of gravel upstream of the bridge. The gravel was excavated and placed between existing breakwaters in the right bank, stone was placed round the piers and a stone-filled gabion check-dam was constructed across the channel downstream of the bridge. No further scour has been experienced.

(c) MAWBRAV BECK

Approval for grant-aid for this scheme was received from the Ministry in June and work commenced in August. The scheme provides for the improvement of Mawbray Beck, near Mawbray, from near the outfall into the Solway Firth, to the main river limit, near Newtown, a distance of about 2 miles. The watercourse is being widened and considerably regraded to allow field tile drainage to be carried out. Three highway culverts are to be reconstructed or re-routed, one of which was done before 31st March. Continuous bank toe timber revetment is necessary because of the very unstable nature of the sub-soil.

The estimated cost of the work is £14,349, which includes £4,737 for the highway culverts. Expenditure to 31st March was £4,383.

(ii) FUTURE WORKS APPROVED IN PRINCIPLE

As mentioned in the previous Annual Report, Schemes for the River Lyvennet near Cliburn, and for Swindale Beck, near Brough, were approved in principle in 1966. A scheme for the River Lyvennet, estimated to cost £5,492, was considered by the Land Drainage Committee in January when it was agreed that in view of the economic situation, further consideration be deferred for 12 months. The Swindale Beck Scheme has not yet been prepared.

The Scheme to provide a flood relief arch at Rosthwaite Bridge over Stone-thwaite Beck in Borrowdale has not yet reached fruition. The County Surveyor's Department of Cumberland County Council are working on the design of a reconstructed bridge with an increased capacity rather than a flood relief arch. An amount of £12,500 has been included in the Authority's estimates for 1968/69 for this work.

The Land Drainage Committee has recommended that a scheme for the improvement of the River Waver between Waverbridge and Waverton be prepared for possible commencement in 1969/70.

The need for grant-aided schemes in the Authority's area has been largely met in previous years and at present there appear to be few places where new schemes could be promoted. The result is, therefore, that there are no further schemes at present under consideration. However, this does not preclude the possibility of schemes which might arise, as a result of unusual or unprecedented flooding, from being considered.

SECTION 2. MAINTENANCE

(a) NORTH WESTERN AREA

RIVER WAMPOOL

The excavation of a length of hard pan from the bed and the removal of silt deposits from the banks downstream of the Carlisle-Silloth railway, commenced in the previous February, were completed during May.

Dredging of the channel upstream of Crofton Bridge began in October and was almost complete to Curthwaite Bridge at the end of the year. Considerable easing of tight bends and associated toe revetment was also done.

The usual weed-cutting, repair of surface drains, etc., has been done during the year.

RIVER WAVER

A breach in the left floodbank near Raby, caused by the tidal flood in February, 1967, was repaired in April.

Dredging of the channel between Abbey Town and Lessonhall, in progress during the previous year, continued through the year and was completed in February.

Gravel accumulations were removed from the channel between Lessonhall and Waverbridge during the summer.

The 1966/67 winter floods caused considerable damage to the unstable length of channel between Waverbridge and Waverton. A tractor-shovel commenced work in July moving shoals and placing fallen trees into erosions to help stabilise the fill. Before the work was completed the October flood caused more damage, particularly just upstream of Waverton. Subsequently heavy limestone pitching and stone-filled gabions were placed as protection to the worst lengths of scour. This particular work was completed in December, but was followed up in January and February with the construction of a gabion check-dam which is intended to check the movement of gravel downstream.

There are about 50 miles of small main river in the North-Western Area which receive annual maintenance to a greater or lesser extent. Most of this length is within internal drainage districts. They have received attention as usual during the year, dragline excavators being used in some cases. A tractor-mounted excavator with a full circle slew was purchased early in the year and this, together with a tractor-mounted grass trimmer, has improved the rate at which this type of maintenance can be done.

Several lengths of watercourses were treated with chemical weed killer and grass-growth retarder, with beneficial results. Aquacide was used on about 4 miles of small river to kill non-emergent weeds but weather conditions were not favourable and there was only moderate success generally.

(b) CENTRAL AREA

NEWLANDS BECK

Large breaches in both banks opposite Thornthwaite were repaired during the year, the remoteness of the site near the head of Bassenthwaite Lake making access particularly difficult. Following a decision to set back the floodbanks and create a berm, work commenced in the Autumn on this work on the right bank downstream of Bog House, Braithwaite. The work includes the installation of new continuous toe revetment. Reasonable progress was made during the winter, but much damage was caused by the large March flood and repair work was in progress at the end of the year.

NADDLE BECK

Following a decision not to proceed with an improvement for this watercourse, the length of about $1\frac{1}{2}$ miles between Naddle and Dale Bottom was well cleaned by dragline excavator between August and December. The upstream $\frac{3}{4}$ mile up to Roughow, which is contained between stone walls, was cleaned by J.C.B. excavator in December and January.

RIVER GLENDERAMACKIN

The work of raising floodbanks and repairs in progress at the end of last year were resumed and completed in May.

ST. JOHNS BECK

The flood of 24th March caused a large breach in the left bank near Bramcrag. Repair work began immediately with the construction of a new gabion wall. The work was still in progress at the end of March.

RIVER MARRON

The channel between Whitekeld and Red How was cleared of accumulated gravel during the summer.

Other work done during the year in this area included the usual weed clearance and bank repairs of smaller rivers, and the emptying of gravel traps where necessary.

(c) SOUTH WESTERN AREA

No mechanical plant was used in this area until September when a dragline excavator began cleaning Eskmeals Beck at Langley culvert. This work was finished in November. Other work has consisted of routine maintenance of banks, using gabions and pitching stone where necessary, weed cutting of the smaller channels and brushing of banks.

(d) EASTERN AREA

RIVER EDEN

The channel near Langford Farm, Warcop, was re-aligned through a large gravel shoal in June, July and August.

The right bank of the newly excavated channel at White Brackens, Nateby, was damaged in several places. In September and October the bank was re-formed where necessary and reinforced with pitching stone.

A very large accumulation of silt had gathered on the right bank in front of the steel sheet piling opposite the River Caldew outfall at Edenside, Carlisle, and willow trees were growing in the silt forming a considerable restriction to flood flows. A dragline excavator commenced the removal of the silt in December and work was still in progress at the end of the year.

General maintenance on other lengths of the River Eden was carried out during the year.

RIVER CALDEW

During April and May a tractor-shovel re-aligned the channel through a very large gravel shoal upstream of Holme Head, Carlisle. Spoil was placed in a large erosion in the right bank which was subsequently toe-revetted. A new length of right floodbank was then constructed.

A length of floodbank opposite Stead McAlpin's Mill, Cummersdale, where groynes were constructed several years ago, had been damaged. The groynes were replaced with continuous gabion toe revetment. This work was done in May and June.

Limestone pitching was placed as protection to scour at the ends of the cascade at the upstream end of the improvement in Carlisle in August.

GOLDRILL AND KIRKSTONE BECKS

Bank repairs on both these mountain streams have been carried out at various times during the year following periods of heavy rain.

RIVER LYVENNET

Work began in August on fairly extensive repairs to both banks downstream of Dairy Bridge, Maulds Meaburn, using pitching stone and quarry waste. The work was suspended in October because of bad site conditions.

BRUNSTOCK BECK

Weed growth in the watercourse was prolific during the summer and a hired J.C.B. followed by a dragline excavator were used for clearance until very high water in October completely stopped the work. In November a dragline excavator re-commenced work dredging the channel and at the end of the year was within a short distance of main river limit.

Other work done during the year in this area included the usual weed clearance and bank repairs of smaller rivers, and the emptying of gravel traps where necessary.

SECTION 3. WORK IN INTERNAL DRAINAGE DISTRICTS ADMINISTERED BY THE AUTHORITY

1. WAVER AND WAMPOOL DISTRICT

All but about 5 miles of the 90 miles of scheduled watercourses were cleaned during the year. Repairs to revetment and bridges were done where necessary. Increasing trouble is being experienced by slipping banks, no doubt caused by the effect of wet weather on the spoil accumulated close to the watercourses by years of hand cleaning.

Once again the weed spraying programme was restricted by unsatisfactory weather conditions.

Tewfit Sough Improvement Scheme, estimated cost £2,314, commenced in July and was substantially complete by the Autumn when wet weather stopped work. A resumption had not been possible by the end of the year.

Finglandrigg Sough Improvement Scheme, estimated cost £5,804, commenced in February and reasonable progress was being made at the end of the year.

2. ALLONBY BAY AND RIVER ELLEN DISTRICT

The usual cleaning and weed cutting was done during the year on the six miles of scheduled watercourses. One watercourse, about $\frac{1}{2}$ mile long, was added to the schedule during the year.

3. UPPER DERWENT DISTRICT

Bank repairs in Coledale Beck, Braithwaite, were done in May.

Tom Rudd Beck, near Westray Farm, Embleton, was cleaned by J.C.B. excavator in October.

Sandy Beck, near Low Rogerscale, was cleaned by J.C.B. excavator in October and November.

Some work was done on Littlethwaite Sough in March.

4. RIVER MARRON DISTRICT

Because of the extremely low rateable value of this district and consequently very small allocation which could be made for maintenance purposes, the Authority decided that no maintenance work should be done during the year under review.

5. BRUNSTOCK BECK DISTRICT

The only scheduled watercourse in this district, Whitrigg Sough, was cleaned by tractor-mounted digger in November and December. This is much later than is usual, but the normal weed growth had been dealt with most effectively by treatment with Aquacide herbicide, which destroys the non-emergent weeds.

SECTION 4. FLOODS

17th October, 1967

The latter half of September was generally wet throughout the area, most of the rivers maintaining fairly high levels. These conditions obtained up to 16th October when there was heavy rain generally. Many rivers were in flood on 17th October and considerable areas of agricultural land were flooded. Levels receded quickly and the land was clear again within 24 hours, except in the Waver and Wampool areas, where flooding persisted for some three days. This flooding caused damage to many of the Authority's land drainage works, flood embankments being breached and newly excavated channels being badly scoured. No reports were received of loss of farm stock, but small acreages of potatoes were spoiled in various places.

23rd-24th March, 1968

Although flooding occurred throughout the Authority's area on these dates, everything was eclipsed by the flood in the Eden Valley. Comparisons with earlier floods are always difficult, but the maximum level at the Eden Bridge, Carlisle, was an inch or so higher than the highest level marked there — that of 8th December, 1856. This is the more remarkable considering the reduction in flood levels achieved by the improvement of the channel downstream in 1949-52. At Willow Holme Power Station, Carlisle, the river level was 2 ft. higher than the most recent large flood of October, 1954. In Appleby records are not exact, but the flood was said to be the highest within living memory.

Rainfall was negligible from the middle of February until 13th March, but was then persistent until 26th March, terminating with continuous rain for about 26 hours when 2 inches was precipitated generally, and fairly uniformly, over a large part of the catchment. Snow also covered much of the upper catchment in the fells and a rapid melt of snow accompanied the final precipitation, these combined circumstances no doubt being the cause of the flood.

The damage caused by the flood was very considerable. During the evening of 23rd March, considerable areas of farm land and the road between Kirkby Stephen and Warcop were flooded. During the night of 23rd/24th March more than 200 premises in Appleby were flooded. The main A.66 trunk road was covered by about 4 ft. of water and the Police Station was evacuated.

Continuing downstream through the night and the early morning of 24th March, the flood damaged hundreds of acres of farmland, depositing large quantities of sand on the fields. Langwathby Bridge, which carries the Penrith-Alston A.686 trunk road, was demolished.

The peak of the flood at the Warwick Bridge gauging station was estimated to be at about 6-30 a.m. on 24th March and to have reached between 40,000 and 43,000 cusecs. The recorder ceased to function as the maximum level was 2 ft. above the station floor. Fortunately the peak of the Irthing flood had passed before the Eden peak reached the confluence, otherwise conditions between here and Carlisle, and in Carlisle itself, would no doubt have been worse than they in fact were. Downstream of the Irthing confluence valuable farm land was again covered with water and left later with thick coverings of sand and debris. Near Crosby-on-Eden a privately owned floodbank was breached and over-topped and a large area of arable land flooded. At the Sheepmount Gauging Station, Carlisle, the flood was estimated to have reached a flow of about 50,000 cusecs.

In Carlisle damage was very extensive in two areas, the residential district in the Warwick Road area and the industrial area of Willow Holme and Caldewgate. Flood water penetrated further up Warwick Road than had previously been known. The recently developed industrial estate at Willow Holme was completely inundated and damage estimated at £250,000 was caused. Water was also deep in Church Street west of Caldew Bridge where Carr's biscuit works, a large timber yard and other smaller businesses were affected. The Willow Holme and Caldewgate area flooding was caused by backing up of water from the Eden into the Caldew where banks were overtopped. Fortunately the River Caldew peak, which was not unusually high, was passed the previous evening.

This flood occurred very near to the end of the year under review, but there is no doubt that the Authority will have to investigate the causes of the flooding and will have to take a very active part in the efforts to alleviate similar floods and to mitigate their effects.

SECTION 5. DRAINAGE CHARGES

No action has been taken by the Authority under Part I of the Land Drainage Act, 1961.

SECTION 6. STATUTORY SCHEMES FOR INTERNAL DRAINAGE BOARDS

None.

PART V

FISHERIES

I. GENERAL REPORT ON THE SALMON, TROUT AND FRESHWATER FISHERIES

I. SALMON AND SEA TROUT

(a) River Eden District

Angling Season:

Salmon: 15th January to 14th October

Sea Trout: 1st April to 14th October

The total of 741 rod caught salmon for this year is the lowest since 1946 and is very much smaller than last year's record total of 2,333. The chief reason for the poor catch by rod and line this year is no doubt due to the fish disease outbreak, which deterred many anglers from fishing particularly during the Spring and Autumn when the disease was rife. This is borne out by the monthly catches in these periods which show a marked reduction.

From the returns made by Nets and Fixed Engines it appears that this year the grilse runs were perhaps smaller than last year and this most likely accounts for the fall in the total catch by these instruments this season.

While the total number of fish caught by rod and line and nets and fixed engines has fallen, the average weight of fish has increased to 13.82 lb. for rods and 11.43 lb. for nets and engines.

Conditions at the start of the season were not good. Water levels were low and the weather cold. Only 16 fish were reported caught on the opening day of the season compared with 45 last year. Due to the high water levels at the start of January fish moved upstream and salmon were reported taken above Armathwaite on the opening day.

At the end of January river levels were again high and the runs of fish coming into the river moved well upstream and during the second half of January the bulk of salmon taken were grassed in the Armathwaite-Lazonby area. During February and the beginning of March the level of the Eden fluctuated considerably and severe floods occurred. When the water level dropped in early March, fishing improved and better catches were reported. Several fish were taken in the Langwathby area, an unusual occurrence at that time of the year.

River levels were more settled from the middle of March until the middle of April and salmon fishing on the Eden showed a great improvement, fish being taken mainly from the middle reaches. Fishing in the Carlisle area had been poor since the season opened, due to the water conditions, fish entering the river being able to move unchecked through the lower reaches and providing poor sport for anglers in this area.

From the middle of April onwards the level of the river fell and remained low until the middle of May and salmon fishing as a result was very poor. In the middle of May there was a welcome rise in level, but this was followed by a period of prolonged high water which hampered fishing, but enabled a run of fish to enter the river and these moved well upstream. It was reported that fresh fish were taken during this time from beats as far upstream as Lazonby. The river did not clear and become settled until the first week of June when the river then fished well.

Sea trout also entered the Eden on this high water and moved well up the river. Sea trout were taken as far upstream as Armathwaite which is earlier than is usual. These fish were noticed to keep to the Eden more than usual and not to move into the Irthing as is normally the case.

The river was low during the last two weeks of June and the first two weeks of July. During this time salmon fishing was very quiet. Sea trout, however, provided good sport to anglers in the Carlisle area and the lower reaches of the Eden. There was a slight rise in water in the middle of July which improved angling, but the river soon dropped again.

At the end of July and the beginning of August river levels were unsettled and the water badly discoloured by soil washed down from the MotorWay workings on the Eamont and Lowther. High water conditions prevailed during the second half of August and these curtailed fishing. There were, however, good runs of grilse and sea trout moving into the river during these two weeks. The high water conditions continued into the first week of September when the water cleared and angling conditions improved and salmon were taken from most stretches from Carlisle to Eamont Foot. Water levels again dropped, but fresh water during the last week of September again improved conditions. During the whole of October the river was in flood and the season finished very quietly due to the high water. These high water levels continued well into November.

As a result of the salmon disease very few redds, particularly of the spring salmon were observed, and the restrictions imposed by the Foot and Mouth Disease outbreak prevented the normal redd count being carried out.

The number of season salmon rod licences (exclusive of general licences) fell sharply from 493 for last year to 405 for this year and the number of seven day and daily licences fell from 1,649 for 1966 to 869 for 1967. Revenue from salmon licences fell from £5,849 for 1966 to £4,668 for this year.

(b) River Esk (Border) District

Angling Season:

Salmon: 1st February to 31st October

Sea Trout: 1st April to 30th September

The total of 238 rod caught salmon is the lowest yearly catch since 1961 and a sharp drop from the last year's total of 516. This is certainly the result of the salmon disease outbreak which deterred many anglers from fishing especially during the Spring and Autumn when the disease was at its worst. There was also a drop in the average weight of fish caught from 12.11 lb. for last year to 10.85 lb. for this season.

In spite of good angling conditions at the opening of the season, catches were poor, only six fish being taken compared with 26 on the opening day last year. During February, river levels dropped and water conditions were not good for fishing. In the last week of February and the first week of March the Border Esk was in flood and exceptionally heavy runs of salmon were observed moving in the river and good catches were taken from beats as far upstream as Canonbie.

River levels from the middle of March to the Middle of April were at a good fishing height and after the slow start at the beginning of the season sport was much improved. A fish of 23 lb. was taken from the Langholm stretch during this period. Several good runs of salmon were observed entering the Esk over this period and fish were also seen moving into the Liddle. Sea trout were also seen moving in the Esk and the lower reaches of the Liddle.

From the middle of April until the middle of May rivers were low. A rise in water then took place, this enabled further runs of fish to enter the river and improved angling conditions. The fresh water continued for a fortnight and during this time catches of salmon and sea trout were very good.

The river levels dropped at the beginning of June and remained low until the middle of July, salmon fishing was consequently poor. Sea trout fishing, especially at night, provided anglers with good sport.

At the beginning of August the rivers were in flood and several good runs of grilse were observed entering the Esk. During the second week of August the rivers cleared and sport was good; good catches of grilse, sea trout and herling being reported taken. The river was high for the remainder of August and for the first week of September and sport was again good. Large numbers of salmon and sea trout were again seen moving in the rivers. The levels of the rivers then fell quite quickly and remained low until the end of September.

Throughout the whole of October river conditions were very unsettled, rivers being flooded for most of the time. During the month fish moved well upstream, by the end of the month the sea trout were moving on to the spawning grounds. The first week of November saw the rivers clearing, sea trout were then observed spawning in large numbers. A few salmon had also moved on to the spawning redds and odd fish were commencing to spawn. For the remainder of November and the first half of December the rivers slowly fell and by the end of November salmon spawning was in full swing.

The numbers of spawning fish, both salmon and sea trout, seen this year was about average, though no actual count was made due to the outbreak of Foot and Mouth Disease.

Netting on the Border Esk was carried out again this year and the total catch was 64 fish compared with 125 for last year.

The number of season salmon rod licences (exclusive of general licences) issued this year fell to 98 as compared with 144 for 1966. Seven day and daily licences also fell, 530 were issued this year compared with 592 for 1966. Revenue from salmon licences fell to £868 compared with £1,142 for last year.

(c) River Ellen District

Angling Season:

Salmon: 1st April to 31st October

Sea Trout: 3rd April to 31st October

The numbers of migratory fish entering the River Ellen continued to improve. It was unfortunate that the disease outbreak occurred at this time, when runs of salmon and sea trout are beginning to be re-established in this river. No doubt as a result of the disease, only 66 salmon were reported caught this season compared with 124 for last year. 92 salmon rod licences were issued this year, a slight drop from the 100 taken out by anglers in 1966.

Migratory fish did not commence to enter the river until the end of May and it was not until the end of June and the beginning of July that salmon or sea trout entered the river in any great numbers.

(d) River Derwent District

Angling Season:

Salmon: 1st April to 31st October.

Sea Trout: 3rd April to 31st October.

This year's total of salmon caught by rod and line showed a marked fall compared with last year's catch. Only 948 salmon being taken this year as against 1,658 for last season. No doubt this was due to the fish disease which deterred many anglers from fishing. The season's catch by nets and fixed engines was 762, a slight improvement on last year and the best since 1963.

Water levels were low at the start of the season and consequently sport was poor, although a few fish moved into the river during March. The level of the river rose at the beginning of May and remained high for most of the month, several small runs of salmon entering the river during this period. These fish moved quickly upstream and fresh run fish were caught in the upper Derwent towards the end of the month. At the end of May river levels started falling and were low until the middle of June.

From mid June until the middle of July rivers were generally high and further runs of fish moved into the river. Again these fish ran straight through the lower and middle reaches. During this time the best catches were taken from the upper Derwent and the River Greta, where, at the end of July, 25 fish were reported taken in three days. Several of the fish were reported to have had sea lice still on them.

Sport on the lower reaches improved during the first three weeks of August when good catches of salmon and grilse were reported from the Cockermouth and Workington areas. Sea trout were not observed in any great numbers and relatively few of these fish had been caught by this time.

At the beginning of September the Derwent and its tributaries were in flood, but conditions improved when the water dropped during the second week of the month. Good catches were reported from the Derwent and good runs of salmon were observed moving in the lower reaches; sea trout were still scarce.

Angling conditions were unsettled for the remainder of the season with river levels fluctuating from day to day. Further runs of fish moved into the river during this time and were observed moving well upstream. Very high river levels prevailed throughout the whole of October and few fish were taken by anglers except on the Cocker which fished well during the last few days of the season.

The high water conditions continued into November and fish moved on to the spawning grounds. While no complete count of redds was possible, it was obvious that good numbers of salmon were spawning, but sea trout tended to be below their usual numbers.

There was a drop in the number of season salmon rod licences issued this year to 431 compared with 526 for 1966. The number of seven day licences also fell slightly to 216 compared with 236 for last year. The revenue from salmon licences fell from £2,723 for 1966 to £2,343 for 1967.

(e) South West Cumberland District

Angling Season:

Salmon: 1st April to 31st October

Sea Trout: 3rd April to 31st October

There was a further drop in the number of salmon caught by rod and line this year to 429 as compared with last year's total of 723; the average weight of the fish taken this season also fell to 7.39 lb.

It was not until the end of April that migratory fish started to enter the rivers in this district, although the river levels had been good at the beginning of the month. While rivers were low at the end of April and the beginning of May, there was plenty of fresh water in them until the end of May.

A few salmon entered the Ehen and the Irt during May, but the fish tended to stay in the lower reaches.

Apart from the River Ehen, which had small runs of fish during the latter half of June, migratory fish did not enter the other rivers in South West Cumberland in any numbers until the first two weeks of July. During this period the Ehen and the Irt provided the best sport, but even then catches were limited to a small number of grilse and sea trout.

It was not until the beginning of September that sufficient water came into the rivers to improve angling conditions to any great extent. During the first two weeks of September sport improved and salmon were reported taken from all rivers, the River Irt was reported to have provided the best sport during this time. Although the rivers had fresh water at times until the end of September, few fish were taken, although fish entered the rivers on these freshets.

Rivers were high during the whole of October and sport improved in all rivers and the season finished well.

During the first half of November the river levels fluctuated continuously and then fell and remained rather low until the latter half of December when levels again rose. Sea trout were reported to have been scarce on the spawning grounds, but on the other hand salmon were observed spawning in large numbers.

In common with other districts there was a fall in the number of season salmon rod licences issued this year, 1,143 being issued for 1967 compared with 1,539 for 1966. The number of seven day licences also fell to 536 for this year compared with 626 for last season. The revenue from salmon licences fell to £3,388 for 1967 as against £4,446 for 1966. In this district a salmon licence is required to fish for sea trout, whereas in the remainder of the Authority's area these fish may be taken on a trout licence.

2. BROWN TROUT

While the disease, which primarily affected migratory fish, was found to be affecting a small percentage of trout, this did not affect trout fishing to any great extent.

Once the weather conditions became more settled trout fishing throughout the area provided good sport to anglers. The best trout fishing undoubtedly being found in the River Eden and its tributaries. The Lakes again fished well and several large trout were reported taken.

The trout fishing continues to attract a very large number of visiting anglers, especially to the Lakes.

During the spawning season large numbers of trout were observed spawning in the tributary streams.

3. FRESHWATER FISH

Licences are not issued by the Authority to fish for freshwater fish. The Authority encourages the removal of coarse fish from the rivers in the area, which are primarily game fish rivers. For this reason many riparian owners have allowed visiting anglers to fish their waters for this purpose. Only coarse fish are taken and in the past these have generally been kept alive and transported for restocking purposes in other areas. Now that the area has been declared an Infected Area under the Diseases of Fish Act this cannot be done, as live fish cannot be moved out of the Area. It is hoped that owners will, however, continue to allow anglers to fish for coarse fish and so help to remove as many as possible of them from the rivers.

4. FISH DISEASE

During the past year all rivers in the Authority's Area were again affected by the salmon disease. The disease has now generally become known as Ulcerative Dermal Necrosis (U.D.N.). This name reflects the symptoms found on infected fish.

This year a change in the pattern of the outbreak, from that observed last year has been seen. This year the majority of fish were found to be dying with the disease during the Spring and Autumn only. Very few fish were found dying during the Summer months. Examination of diseased fish in the laboratory and in the river showed them to be heavily infected with fungus during the Spring, late Autumn and Winter. During the Summer months, while fish were obviously infected, showing areas of ulceration on the head, body and fins, there was generally no fungus to be seen on these areas. From these observations it would seem that the fungus only grows below a certain critical temperature, above this, very little or no growth takes place.

Attempts to reproduce the disease in healthy fish have not so far been successful. Injecting fish with bacteria isolated from diseased fish has on occasions resulted in the death of some fish due to general systematic infections developing. Injecting the fungus has resulted in fungus growth and necrosis of the tissue around the site of injection. In neither case have the symptoms of the disease been seen. It is thought that the bacteria and fungus isolated from the diseased fish are in fact secondary infections and not the cause of the ulcerated area. Efforts are continuing to isolate the causative organism and work is being carried out to prepare tissue cultures so that investigations can be made to determine if the disease is caused by a virus. The Authority wishes to record its appreciation of the help given by Dr. Davis and his staff at the Public Health Laboratory, Carlisle, in carrying out much of the bacteriological work into the disease.

From the observations that it has been possible to make as to the numbers of migratory fish spawning this season, it appears that fewer fish were seen spawning than in recent years. This fact was particularly noticeable in the case of the spring salmon in the River Eden and it is thought that very few of these fish survived to spawn. Sea trout runs have been reported to have been smaller this year. Whether this is due to the effects of the disease or to natural fluctuations is hard to say. The numbers of sea trout seen in the spawning areas this year are reported to be well down on previous years and this is particularly noticeable in the South West Cumberland Rivers.

At the present time it is not possible to predict the long term effects of the disease on stocks of migratory fish in the area. It appears that ova from infected fish hatch naturally and that the alevins are not infected. While fewer fish may survive to spawn and there will be consequently less fry, there will be less competition amongst these fry for food and a larger proportion of them will survive. This, it is hoped, will make good any loss that might occur through fewer fish spawning.

The following numbers of diseased fish were removed from the rivers in the Area during the year.

| | |
|-----------------|--------------------------------|
| 5,848 Salmon | 1,306 Brown Trout |
| 1,270 Sea Trout | 139 Parr |
| | 696 Other fish mostly grayling |

5. FISH HATCHERY

(i) Salmon

Due to the fish disease, U.D.N., a change had to be made in the method of obtaining ova for the hatchery. It was found that diseased fish could not be kept in the holding ponds at the hatchery until they were ready for stripping without heavy mortalities occurring. It was therefore decided to strip those fish that were ready for spawning on the river bank and transport the fertilised ova back to the Hatchery for incubating. As few fish could be obtained from the River Lowther this year, due to the small numbers of fish found in this river, salmon were netted from the Meggat Water, a tributary of the Border Esk, and from the Glenderamackin, a tributary of the River Greta. The restrictions on access to farm land imposed by the Foot and Mouth Disease outbreak meant that the collection of ova had to be stopped before all the ova that could have been accommodated in the Hatchery were obtained and only approximately 420,000 ova were obtained.

(ii) **Sea Trout**

236 hen fish and 60 cock fish obtained from the Border Esk and River Liddle systems were stripped. The average weight of the fish was 1.5lb. and they yielded approximately 248,000 ova. The percentage of salmon and sea trout ova hatching was one of the highest known and is estimated at over 98%. This has been thought due to less silting in the troughs this year due to the stream supplying the Hatchery flooding less frequently. The growth and development of the alevins was very satisfactory and the number that died was very small indeed.

The following is a summary of the planting of fry undertaken and intended from the Hatchery since 1960.

| SALMON | | | | | Up to 1967 (000's) | 1968 (000's) |
|---------------------------------------|-----|-----|-----|-----|-----------------------|-----------------|
| Eden District | | | | | | |
| Tributaries of River Eden | ... | ... | ... | ... | 4585 | — |
| Dacre Beck | ... | ... | ... | ... | — | 30 |
| Sunnygill Beck | ... | ... | ... | ... | — | 30 |
| Raven Beck | ... | ... | ... | ... | — | 30 |
| River Ellen District | | | | | | |
| Cockshott Beck | ... | ... | ... | ... | 25 | — |
| River Esk (Border) District | | | | | | |
| Esk and Tributaries | ... | ... | ... | ... | 145 | — |
| Byken Burn | ... | ... | ... | ... | — | 30 |
| Ewes Water | ... | ... | ... | ... | — | 30 |
| Liddle and Tributaries | ... | ... | ... | ... | 15 | — |
| Muir Burn | ... | ... | ... | ... | — | 30 |
| River Lyne and Tributaries | ... | ... | ... | ... | 80 | — |
| South West Cumberland District | | | | | | |
| River Irt and Tributaries | ... | ... | ... | ... | 180 | — |
| Sennerdale Beck | ... | ... | ... | ... | — | 35 |
| River Ehen and Tributaries | ... | ... | ... | ... | 140 | — |
| River Calder and Tributaries | ... | ... | ... | ... | 150 | — |
| Thwaites Beck | ... | ... | ... | ... | — | 35 |
| River Esk and Tributaries | ... | ... | ... | ... | 60 | — |
| Eel Beck | ... | ... | ... | ... | — | 35 |
| River Annas and Tributaries | ... | ... | ... | ... | 28 | — |
| Santon Hall Beck | ... | ... | ... | ... | — | 35 |
| River Mite and Tributaries | ... | ... | ... | ... | 10 | 35 |
| River Derwent District* | | | | | | |
| River Derwent and Tributaries | ... | ... | ... | ... | 190 | — |
| River Marron and Tributaries | ... | ... | ... | ... | 30 | — |
| River Cocker and Tributaries | ... | ... | ... | ... | 70 | — |
| Hatchery for Feeding | ... | ... | ... | ... | 150 | — |
| Sunnygill Mill Race (for smolts)... | ... | ... | ... | ... | 75 | — |
| Harrington Reservoir (for smolts) | ... | ... | ... | ... | 75 | — |

*In addition to the above restockings this year, 15,000 salmon fry were given to the Cockermouth Angling Association and to the Egremont Angling Association to augment the restocking by these two Associations from their own hatcheries.

SEA TROUT

River Esk (Border) District

| | | | | | | |
|----------------|-----|-----|-----|-----|-------|----|
| River Esk | ... | ... | ... | ... | 217 | — |
| Wauchope | ... | ... | ... | ... | — | 30 |
| Byre Burn | ... | ... | ... | ... | — | 30 |
| River Liddle | ... | ... | ... | ... | 145.5 | — |
| Archer Beck | ... | ... | ... | ... | — | 30 |
| River Lyne | ... | ... | ... | ... | 30 | — |
| Hemplands Beck | ... | ... | ... | ... | — | 10 |

River Eden District

| | | | | | | |
|---------------|-----|-----|-----|-----|------|---|
| River Wampool | ... | ... | ... | ... | 61.5 | — |
| River Waver | ... | ... | ... | ... | 49 | — |

River Ellen District

| | | | | | | |
|-----|-----|-----|-----|-----|----|---|
| ... | ... | ... | ... | ... | 39 | — |
|-----|-----|-----|-----|-----|----|---|

River Derwent District

| | | | | | | |
|---------------|-----|-----|-----|-----|----|----|
| River Derwent | ... | ... | ... | ... | 80 | — |
| River Cocker | ... | ... | ... | ... | 30 | — |
| Whit Beck | ... | ... | ... | ... | — | 25 |
| River Marron | ... | ... | ... | ... | 30 | — |
| Lackliss Beck | ... | ... | ... | ... | — | 25 |

South West Cumberland District

| | | | | | | |
|-----------------|-----|-----|-----|-----|------|----|
| River Ehen | ... | ... | ... | ... | 71.5 | — |
| River Calder | ... | ... | ... | ... | 71.5 | — |
| Scar Green Beck | ... | ... | ... | ... | — | 30 |
| River Irt | ... | ... | ... | ... | 22.5 | — |
| Mickler Beck | ... | ... | ... | ... | — | 30 |
| Cinderdale Beck | ... | ... | ... | ... | — | 30 |
| River Annas | ... | ... | ... | ... | 10 | — |

6. FISHERIES PROTECTION

The following full time staff were employed during the year:—

Fishery Officer,
Assistant Fishery Officer,
Inspector,
3 Head Water Bailiffs,
12 Water Bailiffs.

During conditions of low water, poaching on some rivers continued to give the bailiffs a great deal of extra work.

The Authority wishes to record its appreciation of the services rendered by the Honorary Bailiffs and for the co-operation and assistance given by the Chief Constable and his Officers.

The number of offences dealt with during the year was 125, a decrease of 40 from last year.

| District | Prosecution | Warning | No Action |
|---------------------------|-------------|---------|-----------|
| River Esk (Border) ... | 5 | — | 3 |
| River Eden ... | 38 | 11 | 6 |
| River Ellen ... | 11 | 2 | — |
| River Derwent ... | 14 | 4 | 5 |
| South West Cumberland ... | 19 | 7 | — |

7. LICENCE DUTIES

The Authority made application to the Minister of Agriculture, Fisheries and Food for confirmation of increased licence duties for certain nets and fixed engines. Objections were lodged against the proposals and a public inquiry was held on the 12th and 13th December, 1967.

The Minister had not given his decision by 31st March, 1968.

II. ESTIMATED NUMBER AND GROSS WEIGHT OF SALMON CAUGHT DURING THE SEASON

| | No. | Weight |
|--|-------|-------------|
| (a) With Nets and Fixed Engines | 2,723 | 28,494 lbs. |
| (b) With Rod and Line | 2,422 | 24,774 lbs. |
| Total Number of Salmon Licences issued | 4,569 | |
| Number of Returns Received | 1,458 | |
| Returns Showing Fish taken | 662 | |
| Nil Returns | 796 | |

III. LICENCES ISSUED

| Description of Licence | Salmon | | | Trout and Char | | |
|---|-----------------|--------|---------------|----------------|--------|---------------|
| | No. | Issued | Rate £ s d | No. | Issued | Rate £ s d |
| WHOLE AREA | | | | | | |
| Rod and Line | S. | 27 | 10 10 0 | S. | 79 | 2 0 0 |
| RIVER ESK (Border) DISTRICT | | | | | | |
| (a) Rod and Line | S. | 98 | 5 0 0 | S. | 327 | 1 0 0 |
| | 7D. | 26 | 1 15 0 | 7D. | 129 | 7 6 |
| | 1D. | 504 | 10 0 | 1D. | 971 | 2 6 |
| | | | | S.J. | 63 | 5 0 |
| (b) General Licences | | 1 | 40 0 0 | | | |
| | | 1 | 20 0 0 | | | |
| (c) Draft Net | | 1 | 20 0 0 | | | |
| RIVER EDEN DISTRICT | | | | | | |
| (a) Instruments other than Rod and Line viz:— | | | | | | |
| Coops | | 3 | 50 0 0 | | | |
| Draft Nets | | 2 | 40 0 0 | | | |
| Hang Nets | | 1 | 25 0 0 | | | |
| Haaf Nets | | 201 | 5 5 0 | | | |
| (b) Rod and Line | S. | 128 | 7 0 0 | S. | 2426 | 1 0 0 |
| | 7D. | 106 | 2 10 0 | 7D. | 1764 | 7 6 |
| | 1D. | 763 | 15 0 | 1D. | 4929 | 2 6 |
| | S.A.A.W.1. | 109 | 4 0 0 | S.J. | 1370 | 5 0 |
| | S.D./S.N.E.F.2. | 168 | 4 0 0 | | | |
| (c) General Licences | | 1 | 100 0 0 | | 1 | 10 0 0 |
| | | 1 | 70 0 0 | | 1 | 6 6 0 |
| | | 1 | 65 0 0 | | 1 | 5 0 0 |
| | | 1 | 60 0 0 | | | |
| | | 2 | 50 0 0 | | | |
| | | 1 | 45 0 0 | | | |
| | | 1 | 35 0 0 | | | |
| | | 1 | 23 0 0 | | | |

RIVER ELLEN AND ALLONBY BAY DISTRICT

| | | | | | | | | | | |
|--------------|-----|----|---|---|---|------|-----|---|---|---|
| Rod and Line | S. | 89 | 2 | 0 | 0 | S. | 198 | 1 | 0 | 0 |
| | 7D. | 3 | 1 | 0 | 0 | 7D. | 27 | | 7 | 6 |
| | | | | | | S.J. | 123 | | 5 | 0 |

RIVER DERWENT DISTRICT

(a) Instruments other than Rod and

Line viz:—

| | | | | |
|-----------|---|-----|---|---|
| Coops | 1 | 100 | 0 | 0 |
| Hang Nets | 1 | 25 | 0 | 0 |

(b) Rod and Line

| | | | | | | | | | |
|--------------|-----|---|----|---|------|------|---|---|---|
| S. | 83 | 6 | 0 | 0 | S. | 543 | 1 | 0 | 0 |
| 7D. | 216 | 1 | 10 | 0 | 7D. | 1162 | | 7 | 6 |
| S.D./S.O.B.3 | 176 | 5 | 0 | 0 | 1D. | 1320 | | 2 | 6 |
| S.R.C.4 | 84 | 3 | 0 | 0 | S.J. | 638 | | 5 | 3 |
| S.A.O.B.5 | 88 | 3 | 0 | 0 | | | | | |

SOUTH WEST CUMBERLAND DISTRICT

(a) Instruments other than Rod and

Line viz:—

| | | | | |
|-------|---|----|---|---|
| Garth | 1 | 50 | 0 | 0 |
|-------|---|----|---|---|

(b) Rod and Line

| | | | | | | | | | |
|------|-----|---|----|---|-----|-----|---|---|---|
| S. | 785 | 3 | 0 | 0 | S. | 90 | 1 | 0 | 0 |
| 7D. | 536 | 1 | 10 | 0 | 7D. | 358 | | 7 | 6 |
| S.J. | 358 | | 10 | 0 | | | | | |

Trout & Char
(Excluding Migratory Trout)

S.=Season

S.J.=Season Juvenile

7D.=Seven Day

1D.=One Day

1=Above Armathwaite Weir,
River Eden

2=Downstream North Eastern
Fence, Linstock, River Eden.

3=Downstream Ouse Bridge,
River Derwent

4=River Cocker Only.

5=Above Ouse Bridge River Derwent

IV. APPROXIMATE NUMBER OF MEN ENGAGED IN COMMERCIAL SALMON AND TROUT FISHING:—

| Nets | Licence Holders | Endorsees |
|---------------|-----------------|-----------|
| Haaf Nets | 201 | — |
| Draft Nets | 3 | 5 |
| Hang Nets | 2 | 3 |
| Fixed Engines | 3 | 9 |

V. NUMBER OF PROSECUTIONS INSTITUTED DURING THE FINANCIAL YEAR WITH NATURE OF OFFENCES AND RESULT OF ACTION

| | Fines | | | Result of Action | | | Others |
|--|-------|---|---|------------------|----|---|----------------------------|
| | £ | s | d | £ | s | d | |
| RIVER ESK (Border) DISTRICT | | | | | | | |
| 1 Attempting to take fish by means of poisonous or noxious substance ... | 50 | 0 | 0 | 10 | 10 | 0 | plus 3 months imprisonment |
| 2 In possession of illegal instrument | 10 | 0 | 0 | — | | | 1 admonished |
| 2 Taking fish by illegal means ... | 30 | 0 | 0 | — | | | |

RIVER EDEN DISTRICT

| | | | | | | | |
|----|--|----|---|---|----|---|---|
| 20 | Fishing with unlicensed instrument | 34 | 0 | 0 | 32 | 2 | 0 |
| 10 | Using illegal bait | 26 | 0 | 0 | 19 | 7 | 0 |
| 6 | Groundbaiting | 17 | 0 | 0 | 5 | 5 | 0 |
| 1 | In possession of fish illegally caught and groundbaiting | 5 | 0 | 0 | 3 | 0 | 0 |
| 1 | Taking immature fish | 3 | 0 | 0 | 2 | 2 | 0 |

RIVER ELLEN DISTRICT

| | | | | | | | | |
|---|--|---|---|---|---|---|---|----------------------------|
| 1 | Being in possession of fish illegally caught | — | — | — | — | — | — | case dismissed |
| 5 | Taking fish by illegal means ... | 6 | 0 | 0 | 2 | 2 | 0 | 1 conditional discharge |
| 1 | Aiding and abetting | 5 | 0 | 0 | 2 | 2 | 0 | |
| 1 | Giving false name and address ... | 2 | 0 | 0 | 2 | 2 | 0 | |
| 1 | Refusing to give name and address | 2 | 0 | 0 | | | | |
| 1 | Removing fish from river ... | 2 | 0 | 0 | | | | |
| 1 | Fishing with unlicensed instrument | 5 | 0 | 0 | | | | |

RIVER DERWENT DISTRICT

| | | | | | | | | |
|---|---|----|---|---|---|---|---|----------------------------|
| 9 | Fishing with unlicensed instrument | 9 | 0 | 0 | 7 | 7 | 0 | 4 conditional discharge |
| 2 | Attempting to take fish by illegal means and aiding and abetting ... | 20 | 0 | 0 | 6 | 6 | 0 | |
| 1 | Fishing with illegal instrument ... | 10 | 0 | 0 | 3 | 3 | 0 | |
| 1 | Fishing with illegal bait | 1 | 0 | 0 | | | | |
| 1 | Groundbaiting | 1 | 0 | 0 | | | | |

SOUTH WEST CUMBERLAND DISTRICT

| | | | | | | | | |
|----|-------------------------------------|----|---|---|----|----|---|----------------------------|
| 10 | Taking fish by illegal means ... | 32 | 0 | 0 | 12 | 12 | 0 | 1 3 months imprisonment |
| 4 | Obstructing bailiff | 12 | 0 | 0 | 6 | 6 | 0 | |
| 2 | In possession of illegal instrument | 6 | 0 | 0 | 2 | 2 | 0 | |
| 2 | Aiding and abetting | 6 | 0 | 0 | 2 | 2 | 0 | |
| 1 | Fishing with unlicensed instrument | 2 | 0 | 0 | 2 | 2 | 0 | |

VI. ASSESSED FISHERIES

| | | |
|-----|-----------------------|-----------|
| (a) | Total Annual Value | £611 10 0 |
| (b) | Rate in the £ imposed | Nil |

VII. FISHERY RESEARCH

In addition to the work carried out in connection with the fish disease, the following research was completed this year.

(a) Scale Reading. As a result of the request made to anglers fishing the Border Esk and the River Eden during the season a total of 202 sets of salmon scales were returned together with complete details as to the length, weight, sex and date of capture of the fish. Of these 149 were from fish caught in the Eden and 53 from fish taken in the Border Esk.

Unfortunately the great majority of scales were returned from fish caught during the early part of the season and this has meant that a comparison can only be made of the spring fish runs. The following tables give the results obtained from the examination of the scales returned.

TABLE 1
COMPARISON OF PERCENTAGE OF SMALL AND LARGE
SPRING FISH

| | River Eden | | River Border Esk | |
|-------------------|------------|-------|------------------|-------|
| | Number | % | Number | % |
| Small Spring Fish | 27 | 18.9 | 19 | 46.3 |
| Large Spring Fish | 116 | 81.1 | 22 | 53.7 |
| TOTAL | 143 | 100.0 | 41 | 100.0 |

TABLE II.
COMPARISON BETWEEN THE NUMBERS AND PERCENTAGE
COMPOSITION AND AVERAGE WEIGHTS OF HEN AND COCK
SPRING SALMON

| | | River Eden | | | River Border Esk | | |
|---------------------|---------------|------------|------------|---------------------|------------------|------------|-------------|
| | | Number | Percentage | Average Weight lbs. | Number | Percentage | Weight lbs. |
| Small Spring Fish : | Cock Fish ... | 14 | 51.9 | 8.8 | 8 | 42.1 | 9.3 |
| | Hen Fish ... | 13 | 48.1 | 9.1 | 11 | 57.9 | 10.0 |
| | Total ... | 27 | 100.0 | 8.95 | 19 | 100.0 | 9.65 |
| Large Spring Fish : | Cock Fish ... | 76 | 65.5 | 16.7 | 12 | 54.5 | 15.6 |
| | Hen Fish ... | 40 | 34.5 | 16.6 | 10 | 45.5 | 14.6 |
| | Total ... | 116 | 100.0 | 16.65 | 22 | 100.0 | 15.1 |

TABLE III.
WEIGHT DISTRIBUTION OF SPRING FISH
LARGE SPRING FISH

| Weight lbs. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | Total Nos. | Av. Wt., lbs. |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|------------------|
| River Eden | 1 | 3 | 3 | 4 | 10 | 16 | 25 | 16 | 13 | 6 | 8 | 5 | 4 | 1 | — | — | — | 1 | — | 116 | 16.65 |
| Border Esk | 1 | — | 3 | 3 | 2 | 4 | 4 | 3 | — | 2 | — | — | — | — | — | — | — | — | — | 22 | 15.1 |

88

SMALL SPRING FISH

| Weight lbs. | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Total Nos. | Av. Wt. lbs. |
|-------------|---|---|---|---|---|----|----|----|----|---------------|-----------------|
| River Eden | 1 | 1 | 4 | 7 | 5 | 5 | 2 | 1 | 1 | 27 | 8.95 |
| Border Esk | — | 2 | — | 4 | 5 | 2 | 3 | 1 | 2 | 19 | 9.65 |

TABLE IV.
PERCENTAGE WEIGHT DISTRIBUTION OF COCK AND HEN SALMON
(LARGE SPRING FISH) RIVER EDEN

| Weight lbs. | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | Total No. | Av. Wt. lbs. |
|-------------------------------|-----|-----|-----|-----|------|------|------|------|------|-----|------|-----|-----|-----|----|----|----|-----|-----------|--------------|
| Number of Cock Fish | — | 2 | 3 | 3 | 6 | 12 | 14 | 11 | 7 | 4 | 8 | 2 | 3 | — | — | — | — | 1 | 76 | 16.7 |
| Percentage of Cock Fish | — | 2.6 | 3.9 | 3.9 | 7.9 | 15.8 | 18.4 | 14.5 | 9.2 | 5.3 | 10.5 | 2.6 | 3.9 | — | — | — | — | 1.3 | 100 | — |
| Number of Hen Fish | 1 | 1 | — | 1 | 4 | 4 | 11 | 5 | 6 | 2 | — | 3 | 1 | 1 | — | — | — | — | 40 | 16.6 |
| Percentage of Hen Fish | 2.5 | 2.5 | — | 7.5 | 10.0 | 10.0 | 27.5 | 12.5 | 15.0 | 5.0 | — | 7.5 | 2.5 | 2.5 | — | — | — | — | 100 | — |
| Number of Cock & Hen Fish | 1 | 3 | 3 | 4 | 10 | 16 | 25 | 16 | 13 | 6 | 8 | 5 | 4 | 1 | — | — | — | 1 | 116 | 16.65 |
| Percentage of Cock & Hen Fish | 0.9 | 2.6 | 2.6 | 3.4 | 8.6 | 13.8 | 21.5 | 13.8 | 11.4 | 2.5 | 6.9 | 4.3 | 3.4 | 0.9 | — | — | — | 0.9 | 100 | — |

TABLE V.
THE DIFFERENTIATION OF AGE CLASSES ACCORDING TO PARR AGE
AT MIGRATION

(a) River Eden

| Sea Age \ Parr Age | 1 + | 2 | 2 + | 3 | Total |
|-----------------------|-----|----|-----|---|-------|
| Grisle 1 + | — | 2 | 2 | — | 4 |
| Small Spring Fish 2 | — | 21 | 6 | — | 27 |
| Small Summer Fish 2 + | — | — | 1 | — | 1 |
| Large Spring Fish 3 | 1 | 74 | 41 | — | 116 |
| Large Summer Fish 3 + | — | — | — | — | — |
| Previous Spawners | — | 1 | — | — | 1 |
| <u>TOTAL</u> | — | 98 | 50 | — | 149 |

(b) Border Esk

| Sea Age \ Parr Age | 1 + | 2 | 2 + | 3 | Total |
|-----------------------|-----|----|-----|---|-------|
| Grisle 1 + | — | 1 | — | — | 1 |
| Small Spring Fish 2 | — | 12 | 6 | 1 | 19 |
| Small Summer Fish 2 + | — | 3 | 5 | — | 8 |
| Large Spring Fish 3 | — | 9 | 13 | — | 22 |
| Large Summer Fish 3 + | — | — | 1 | 1 | 2 |
| Previous Spawners | — | 1 | — | — | 1 |
| <u>TOTAL</u> | — | 26 | 25 | 2 | 53 |

TABLE VI.
PERCENTAGE COMPOSITION OF SPRING SALMON RUNS ACCORDING
TO PARR AGE AT MIGRATION

| River Eden | | | | | | Border Esk | | | | |
|--------------------|-----|------|------|---|-------|------------|------|------|-----|-------|
| Sea Age \ Parr Age | 1 + | 2 | 2 + | 3 | Total | 1 + | 2 | 2 + | 3 | Total |
| Small Spring Fish | — | 77.8 | 22.2 | — | 100. | — | 63.1 | 31.6 | 5.3 | 100. |
| Large Spring Fish | 0.9 | 63.8 | 35.3 | — | 100. | — | 40.9 | 59.1 | — | 100. |

As can be seen from the above tables there are differences in the composition of the spring salmon runs between the Border Esk and the River Eden (assuming that the sample of scales examined reflect the true composition of salmon stocks). Further studies will be necessary over the next four or five years to evaluate the significance of these differences and to ascertain how stocks vary from year to year in each river. It is, therefore, intended to continue this work over the next five years. During this time it is hoped that it will be possible to extend this work to cover other rivers in the Area.

(b) *Fish Tagging.* No fish were tagged this year due to the continued outbreak of fish disease.

(c) *The Survival of Ova in Natural Redds.* Due to the limitations on access to farm land, brought about by the outbreak of Foot and Mouth Disease last Winter and Spring, it was only possible to carry out a very limited amount of work into this matter. Nevertheless some useful results were obtained and these indicate that in rivers where there is an unstable bottom strata or silt is deposited, rather heavy mortalities can be expected amongst ova in the redds.

(d) *The Survival of Green and Eyed Ova in Artificial Restocking.* Again owing to the Foot and Mouth Disease outbreak no work on this subject could be carried out.

(e) *The Amount and Time of Availability of Natural Food.* During the year surveys were carried out on the River Lowther and two tributary streams, Force Beck and Swindale Beck, as to the amount of natural food and the time of the year these aquatic organisms become available to fry. The results obtained will be of value in deciding at what time of the year and what streams can best be used for restocking with fry.

(f) *River Flows and Salmon Catches.* Work has commenced on correlating river heights with optimum angling conditions. In this work, the change in the layout of the return made by anglers of salmon caught during the season has enabled daily salmon catches on each river to be compiled. While this work can only be done this year on the Eden and Derwent as these are the only two rivers where adequate river gaugings are available for the whole season and sufficient fish were caught to produce adequate data. The extension of the Authority's river gauging programme should enable this work to be extended to other rivers in the Area.

(g) *Future Research.* As most of the research undertaken this year will have to be continued over the next few years if significant results are to be obtained, no further extensive subjects of research can be contemplated with the present Fisheries Department Staff.

Appendix I

RETURNS OF SALMON CAUGHT

(a) RIVER EDEN DISTRICT

(i) Rod and Line

Salmon

| | Year | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Total No. | Total Weight | Average Weight |
|----|------|------|------|------|-------|-----|------|------|------|-------|------|--------------|-----------------|-------------------|
| 88 | 1947 | 53 | 61 | 120 | 317 | 229 | 55 | 32 | 10 | 19 | 45 | 941 | 13,809 lb. | 14.68 lb. |
| | 1948 | 115 | 290 | 296 | 414 | 194 | 91 | 95 | 36 | 102 | 73 | 1,706 | 24,151 lb. | 14.16 lb. |
| | 1949 | 94 | 267 | 519 | 415 | 165 | 68 | 23 | 16 | 8 | 5 | 1,580 | 26,807 lb. | 16.97 lb. |
| | 1950 | 96 | 276 | 329 | 323 | 203 | 38 | 17 | 12 | 21 | 20 | 1,335 | 19,576 lb. | 14.66 lb. |
| | 1951 | 103 | 281 | 319 | 407 | 261 | 55 | 30 | 18 | 50 | 22 | 1,546 | 24,593 lb. | 15.91 lb. |
| | 1952 | 110 | 304 | 394 | 331 | 169 | 66 | 24 | 28 | 56 | 83 | 1,565 | 22,679 lb. | 14.49 lb. |
| | 1953 | 78 | 244 | 291 | 306 | 128 | 58 | 22 | 37 | 46 | — | 1,210 | 17,834 lb. | 14.74 lb. |
| | 1954 | 114 | 224 | 503 | 383 | 252 | 109 | 58 | 52 | 76 | — | 1,771 | 23,867 lb. | 13.48 lb. |
| | 1955 | 177 | 402 | 471 | 365 | 320 | 62 | 26 | 25 | 72 | — | 1,920 | 28,629 lb. | 14.91 lb. |
| | 1956 | 166 | 200 | 394 | 244 | 182 | 65 | 35 | 49 | 154 | — | 1,489 | 20,236 lb. | 13.58 lb. |
| | 1957 | 220 | 485 | 533 | 327 | 196 | 41 | 40 | 61 | 136 | 55 | 2,094 | 27,228 lb. | 13.00 lb. |
| | 1958 | 193 | 383 | 373 | 315 | 278 | 97 | 52 | 64 | 81 | 38 | 1,874 | 24,411 lb. | 13.03 lb. |
| | 1959 | 195 | 331 | 531 | 372 | 227 | 52 | 23 | 12 | 30 | 26 | 1,799 | 23,784 lb. | 13.22 lb. |
| | 1960 | 211 | 317 | 410 | 283 | 118 | 26 | 23 | 58 | 69 | 104 | 1,619 | 22,525 lb. | 13.91 lb. |
| | 1961 | 153 | 361 | 387 | 272 | 147 | 36 | 31 | 37 | 73 | 38 | 1,535 | 20,165 lb. | 13.14 lb. |
| | 1962 | 164 | 346 | 291 | 327 | 198 | 43 | 33 | 55 | 130 | 95 | 1,682 | 23,559 lb. | 14.00 lb. |
| | 1963 | 17 | 61 | 352 | 431 | 231 | 51 | 46 | 67 | 210 | 149 | 1,615 | 20,163 lb. | 12.48 lb. |
| | 1964 | 123 | 202 | 231 | 256 | 188 | 62 | 26 | 50 | 134 | 163 | 1,435 | 17,877 lb. | 12.46 lb. |
| | 1965 | 309 | 293 | 393 | 355 | 211 | 59 | 58 | 136 | 140 | 130 | 2,084 | 25,336 lb. | 12.16 lb. |
| | 1966 | 213 | 388 | 576 | 397 | 303 | 78 | 53 | 79 | 147 | 99 | 2,333 | 31,225 lb. | 13.38 lb. |
| | 1967 | 64 | 123 | 237 | 49 | 14 | 12 | 24 | 80 | 118 | 20 | 741 | 10,243 lb. | 13.82 lb. |

RETURNS OF SALMON CAUGHT—Continued.

RIVER EDEN DISTRICT

(ii) Nets and Fixed Engines

Salmon

(Exclusive of Haaf Nets up to and including 1955)

| Year | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Total No. | Total Weight | Average Weight |
|------|------|------|-------|-----|------|-------|-------|-------|--------------|-----------------|-------------------|
| 1947 | 15 | 18 | 67 | 98 | 69 | 145 | 369 | — | 781 | 8,179 lb. | 10.47 lb. |
| 1948 | 71 | 155 | 124 | 151 | 154 | 243 | 178 | — | 1,076 | 13,855 lb. | 12.88 lb. |
| 1949 | 319 | 133 | 107 | 137 | 136 | 287 | 178 | — | 1,297 | 17,125 lb. | 13.20 lb. |
| 1950 | 51 | 64 | 55 | 93 | 223 | 128 | 75 | — | 689 | 8,012 lb. | 11.63 lb. |
| 1951 | 55 | 76 | 101 | 87 | 105 | 192 | 186 | — | 802 | 9,258 lb. | 11.88 lb. |
| 1952 | 123 | 103 | 155 | 118 | 151 | 389 | 168 | — | 1,207 | 13,468 lb. | 11.16 lb. |
| 1953 | 94 | 66 | 100 | 131 | 171 | 234 | 131 | — | 927 | 10,394 lb. | 11.21 lb. |
| 1954 | 102 | 142 | 221 | 141 | 90 | 200 | 63 | — | 959 | 10,891 lb. | 11.36 lb. |
| 1955 | 68 | 109 | 196 | 107 | 135 | 440 | 491 | — | 1,546 | 15,930 lb. | 10.30 lb. |
| 1956 | 104 | 194 | 183 | 221 | 334 | 534 | 151 | 9 | 1,730 | 19,398 lb. | 11.21 lb. |
| 1957 | 73 | 107 | 145 | 177 | 393 | 317 | 338 | 7 | 1,557 | 14,950 lb. | 9.60 lb. |
| 1958 | 98 | 127 | 193 | 183 | 213 | 391 | 378 | 18 | 1,601 | 16,744 lb. | 10.46 lb. |
| 1959 | 340 | 169 | 189 | 316 | 343 | 383 | 830 | 22 | 2,592 | 28,408 lb. | 10.96 lb. |
| 1960 | 33 | 69 | 206 | 253 | 285 | 465 | 640 | 30 | 1,981 | 20,422 lb. | 10.31 lb. |
| 1961 | 84 | 246 | 123 | 158 | 435 | 710 | 483 | 33 | 2,272 | 24,872 lb. | 10.95 lb. |
| 1962 | 69 | 98 | 84 | 178 | 324 | 507 | 512 | 34 | 1,806 | 18,639 lb. | 10.32 lb. |
| 1963 | 27 | 59 | 145 | 257 | 380 | 417 | 740 | 54 | 2,079 | 21,512 lb. | 10.35 lb. |
| 1964 | 62 | 58 | 90 | 171 | 302 | 739 | 968 | 45 | 2,435 | 23,331 lb. | 9.58 lb. |
| 1965 | 88 | 78 | 87 | 172 | 365 | 532 | 189 | 29 | 1,540 | 17,122 lb. | 11.12 lb. |
| 1966 | 45 | 116 | 97 | 163 | 319 | 1,264 | 1,140 | 45 | 3,189 | 30,662 lb. | 9.74 lb. |
| 1967 | 107 | 89 | 78 | 94 | 276 | 768 | 455 | 19 | 1,886 | 21,573 lb. | 11.43 lb. |

RETURNS OF SALMON CAUGHT — CONTINUED

(b) RIVER ESK (Border) DISTRICT. (To Scottish Border only).

(i) Rod and Line

Salmon

| Year | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Total No. | Total Weight | Average Weight |
|------|------|------|-------|-----|------|------|------|-------|------|-----------|--------------|----------------|
| 1953 | 13 | 22 | 27 | 16 | 4 | 6 | 12 | 20 | 27 | 147 | 1,948 lb. | 13.25 lb. |
| 1954 | 27 | 75 | 40 | 26 | 8 | 8 | 9 | 18 | 30 | 241 | 2,982 lb. | 12.37 lb. |
| 1955 | 43 | 102 | 55 | 23 | 6 | 2 | — | 11 | 99 | 341 | 4,730 lb. | 13.87 lb. |
| 1956 | 8 | 17 | 19 | 23 | 5 | 5 | 18 | 47 | 76 | 218 | 2,708 lb. | 12.42 lb. |
| 1957 | 38 | 41 | 40 | 17 | 9 | 15 | 28 | 98 | 73 | 359 | 3,778 lb. | 10.52 lb. |
| 1958 | 62 | 62 | 41 | 36 | 11 | 7 | 29 | 39 | 66 | 353 | 4,166 lb. | 11.80 lb. |
| 1959 | 31 | 70 | 36 | 32 | 4 | 11 | 4 | 26 | 84 | 298 | 3,652 lb. | 12.26 lb. |
| 1960 | 24 | 55 | 42 | 16 | 14 | 14 | 23 | 56 | 66 | 310 | 3,596 lb. | 11.60 lb. |
| 1961 | 41 | 29 | 32 | 23 | 9 | 9 | 14 | 30 | 43 | 230 | 2,989 lb. | 12.99 lb. |
| 1962 | 30 | 27 | 27 | 32 | 10 | 15 | 30 | 115 | 113 | 399 | 4,533 lb. | 11.36 lb. |
| 1963 | 6 | 31 | 75 | 58 | 27 | 31 | 52 | 114 | 226 | 620 | 7,390 lb. | 11.92 lb. |
| 1964 | 54 | 36 | 34 | 18 | 9 | 14 | 32 | 107 | 191 | 495 | 5,583 lb. | 11.38 lb. |
| 1965 | 47 | 58 | 42 | 28 | 15 | 23 | 30 | 59 | 106 | 408 | 5,040 lb. | 12.35 lb. |
| 1966 | 36 | 30 | 37 | 13 | 17 | 16 | 56 | 146 | 165 | 516 | 6,250 lb. | 12.11 lb. |
| 1967 | 6 | 13 | 10 | 7 | 6 | 15 | 49 | 98 | 34 | 238 | 2,582 lb. | 10.85 lb. |

(ii) Net and Fixed Engines

Salmon

| Year | | | | Feb. | March | April | May | June | July | Aug. | Total No. | Total Weight | Average Weight |
|------|-----|-----|-----|------|-------|-------|-----|------|------|------|-----------|--------------|----------------|
| 1954 | ... | ... | ... | 9 | 20 | 12 | 46 | 45 | 31 | 3 | 166 | 1,997 lb. | 12.03 lb. |
| 1955 | ... | ... | ... | 9 | 3 | 17 | 6 | 11 | 47 | 37 | 130 | 1,141 lb. | 8.77 lb. |
| 1956 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1957 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1958 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1959 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1960 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1961 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1962 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1963 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1964 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1965 | ... | ... | ... | — | — | — | — | — | — | — | — | — | — |
| 1966 | ... | ... | ... | — | — | 1 | 1 | 35 | 40 | 48 | 125 | 1,167 lb. | 9.33 lb. |
| 1967 | ... | ... | ... | — | — | — | — | 35 | 22 | 7 | 64 | 768 lb. | 12.00 lb. |

RETURNS OF SALMON CAUGHT—Continued

(c) RIVER DERWENT DISTRICT

(i) Rod and Line

Salmon

| Year | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Total No. | Total Weight | Average Weight |
|------|-------|-----|------|------|------|-------|-------|------|-----------|--------------|----------------|
| 1950 | — | 7 | 6 | 81 | 165 | 137 | 142 | 29 | 567 | — | — |
| 1951 | 4 | 8 | 4 | 93 | 152 | 183 | 86 | 15 | 545 | — | — |
| 1952 | 14 | 15 | 37 | 140 | 200 | 123 | 223 | 76 | 828 | 8,405 lb. | 10.15 lb. |
| 1953 | 5 | 10 | 20 | 168 | 153 | 201 | 215 | — | 772 | 7,540 lb. | 9.76 lb. |
| 1954 | 14 | 9 | 90 | 213 | 337 | 329 | 190 | — | 1,182 | 12,317 lb. | 10.42 lb. |
| 1955 | 8 | 19 | 47 | 63 | 14 | 192 | 425 | — | 768 | 6,074 lb. | 7.91 lb. |
| 1956 | 3 | 16 | 18 | 129 | 604 | 468 | 512 | — | 1,750 | 15,996 lb. | 9.14 lb. |
| 1957 | 7 | 16 | 18 | 135 | 445 | 541 | 257 | — | 1,419 | 11,119 lb. | 7.84 lb. |
| 1958 | 14 | 45 | 60 | 145 | 521 | 603 | 588 | — | 1,976 | 17,981 lb. | 9.10 lb. |
| 1959 | 14 | 29 | 22 | 54 | 35 | 33 | 320 | — | 507 | 4,732 lb. | 9.33 lb. |
| 1960 | 21 | 9 | 23 | 116 | 227 | 406 | 369 | — | 1,171 | 9,618 lb. | 8.21 lb. |
| 1961 | 10 | 20 | 32 | 205 | 220 | 237 | 302 | — | 1,026 | 10,260 lb. | 10.00 lb. |
| 1962 | 5 | 18 | 43 | 86 | 630 | 639 | 546 | — | 1,967 | 15,825 lb. | 8.45 lb. |
| 1963 | 6 | 54 | 68 | 197 | 498 | 740 | 673 | — | 2,236 | 19,738 lb. | 8.83 lb. |
| 1964 | 10 | 12 | 64 | 237 | 611 | 817 | 1,031 | — | 2,782 | 22,628 lb. | 8.13 lb. |
| 1965 | 7 | 14 | 52 | 228 | 566 | 485 | 285 | — | 1,637 | 12,945 lb. | 7.91 lb. |
| 1966 | 6 | 33 | 67 | 137 | 607 | 555 | 253 | — | 1,658 | 14,919 lb. | 8.99 lb. |
| 1967 | 3 | 3 | 15 | 105 | 322 | 270 | 230 | — | 948 | 8,253 lb. | 8.71 lb. |

(ii) Nets and Fixed Engines.

Salmon

| | | | | |
|------|---------------|--------|--------------|-----------|
| 1953 | Total Number— | 296; | Total Weight | 2,716 lb. |
| 1954 | Total Number— | 311; | Total Weight | 2,555 lb. |
| 1955 | Total Number— | 112; | Total Weight | 1,059 lb. |
| 1956 | Total Number— | 229; | Total Weight | 2,330 lb. |
| 1957 | Total Number— | 402; | Total Weight | 2,717 lb. |
| 1958 | Total Number— | 662; | Total Weight | 6,262 lb. |
| 1959 | Total Number— | 574; | Total Weight | 5,506 lb. |
| 1960 | Total Number— | 438; | Total Weight | 3,684 lb. |
| 1961 | Total Number— | 148; | Total Weight | 1,454 lb. |
| 1962 | Total Number— | 423; | Total Weight | 2,910 lb. |
| 1963 | Total Number— | 1,351; | Total Weight | 8,312 lb. |
| 1964 | Total Number— | 439; | Total Weight | 2,705 lb. |
| 1965 | Total Number— | 479; | Total Weight | 2,722 lb. |
| 1966 | Total Number— | 740; | Total Weight | 6,263 lb. |
| 1967 | Total Number— | 762; | Total Weight | 6,079 lb. |

RETURNS OF SALMON CAUGHT—Continued

(d) SOUTH WEST CUMBERLAND DISTRICT

(i) Rod and Line

Salmon

| Year | April | May | June | July | Aug. | Sept. | Oct. | Total No. | Total Weight | Average Weight |
|------|-------|-----|------|------|------|-------|------|-----------|--------------|----------------|
| 1953 | — | — | 5 | 69 | 105 | 91 | 35 | 305 | 2,213 lb. | 7.25 lb. |
| 1954 | — | — | 20 | 34 | 64 | 54 | 57 | 229 | 1,833 lb. | 8.00 lb. |
| 1955 | — | 2 | 7 | 19 | 20 | 42 | 56 | 146 | 1,052 lb. | 7.20 lb. |
| 1956 | 1 | — | 8 | 58 | 172 | 99 | 55 | 393 | 2,755 lb. | 7.00 lb. |
| 1957 | 1 | 2 | 11 | 116 | 181 | 219 | 88 | 618 | 4,025 lb. | 6.51 lb. |
| 1958 | 4 | 13 | 49 | 170 | 391 | 367 | 303 | 1,297 | 9,063 lb. | 7.00 lb. |
| 1959 | 1 | 7 | 29 | 69 | 52 | 120 | 182 | 460 | 3,641 lb. | 7.91 lb. |
| 1960 | 1 | 1 | 29 | 84 | 163 | 140 | 81 | 499 | 3,676 lb. | 7.37 lb. |
| 1961 | 5 | 17 | 57 | 99 | 154 | 77 | 108 | 517 | 3,827 lb. | 7.40 lb. |
| 1962 | 4 | 12 | 45 | 191 | 653 | 416 | 239 | 1,560 | 10,793 lb. | 6.92 lb. |
| 1963 | 1 | 7 | 56 | 175 | 381 | 381 | 248 | 1,249 | 9,333 lb. | 7.47 lb. |
| 1964 | 1 | 16 | 90 | 274 | 565 | 381 | 205 | 1,532 | 10,742 lb. | 7.01 lb. |
| 1965 | 1 | 8 | 70 | 197 | 440 | 284 | 113 | 1,113 | 7,670 lb. | 6.89 lb. |
| 1966 | 2 | 19 | 76 | 129 | 244 | 175 | 78 | 723 | 6,142 lb. | 8.49 lb. |
| 1967 | 2 | 5 | 9 | 67 | 127 | 132 | 88 | 429 | 3,271 lb. | 7.39 lb. |

(ii) Nets and Fixed Engines.

Salmon.

| | | | | |
|------|---------------|------|--------------|-----------|
| 1953 | Total Number— | 29; | Total Weight | 254 lb. |
| 1954 | Total Number— | 18; | Total Weight | 149 lb. |
| 1955 | Total Number— | 83; | Total Weight | 555 lb. |
| 1956 | Total Number— | 36; | Total Weight | 196 lb. |
| 1957 | Total Number— | 237; | Total Weight | 1,135 lb. |
| 1958 | Total Number— | 144; | Total Weight | 679 lb. |
| 1959 | Total Number— | 183; | Total Weight | 1,098 lb. |
| 1960 | Total Number— | 183; | Total Weight | 570 lb. |
| 1961 | Total Number— | 90; | Total Weight | 327 lb. |
| 1962 | Total Number— | 78; | Total Weight | 756 lb. |
| 1963 | Total Number— | 250; | Total Weight | 1,447 lb. |
| 1964 | Total Number— | 159; | Total Weight | 586 lb. |
| 1965 | Total Number— | 23; | Total Weight | 238 lb. |
| 1966 | Total Number— | 92; | Total Weight | 647 lb. |
| 1967 | Total Number— | 11; | Total Weight | 74 lb. |

APPENDIX 2.

DIAGRAM SHOWING—

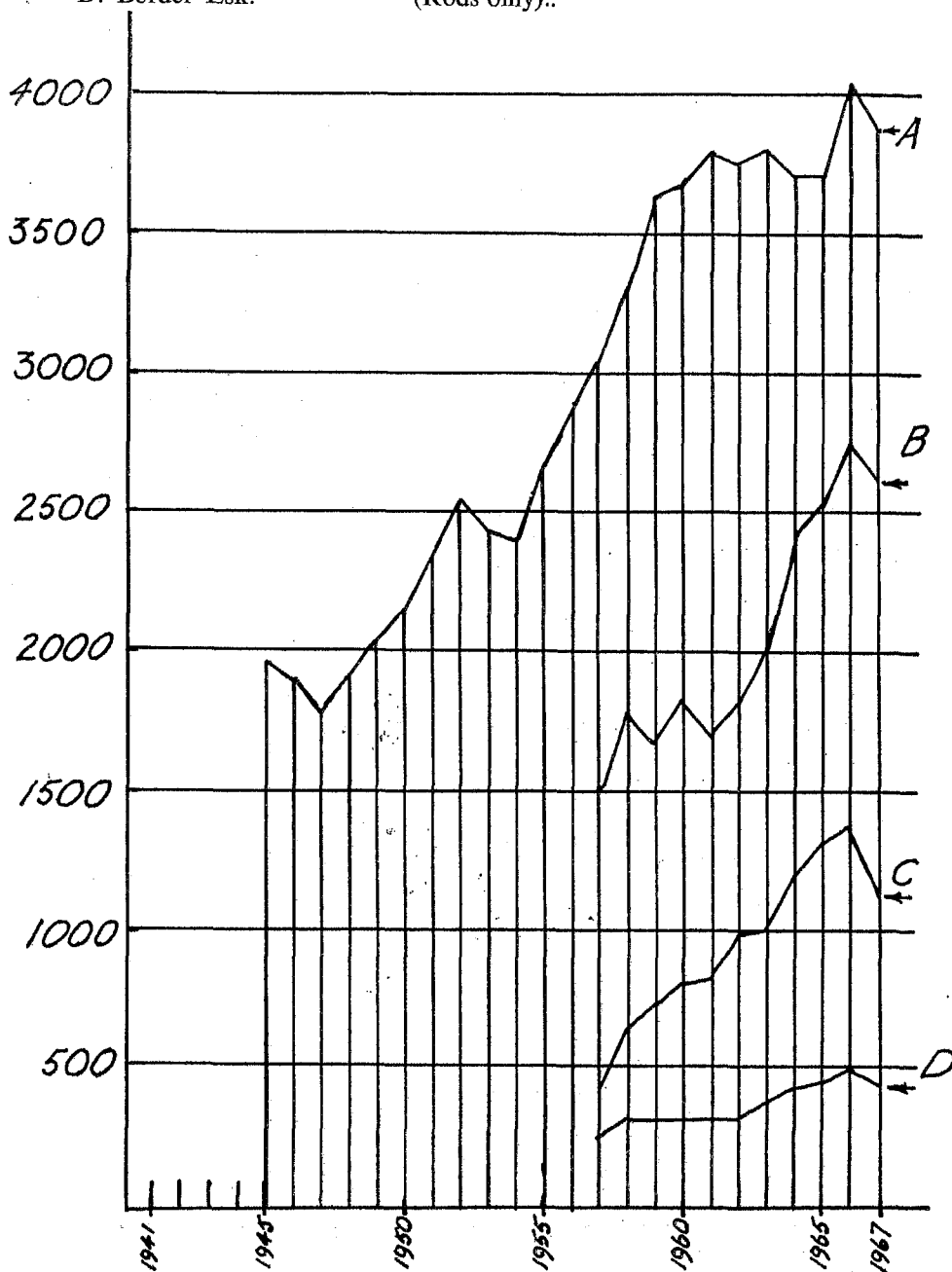
Running five-year average of combined salmon catches for each district.

A. River Eden District. (Rods, nets and fixed engines).

B. River Derwent District. (Rods, nets and fixed engines).

C. South West Cumberland. (Rods and fixed engines).

D. Border Esk. (Rods only)..



PART VI

PREVENTION OF POLLUTION

SECTION 1.—QUALITY OF WATER.

(1) Water quality in the majority of the rivers in the Authority's area continues to be "clean" to "fairly clean" according to the classification of river waters suggested by the Royal Commission on Sewage Disposal. The Rivers Eamont and Lowther which drain to the River Eden have been affected from time to time by drainage from motorway workings, including in one instance erosion of newly poured concrete from bridge foundation works.

The River Petteril, which flows through part of the urban area of Carlisle before outfalling to the River Eden, has improved in quality as a result of the completion of a relief sewerage scheme which also caters for laundry effluent formerly discharged untreated to the river. In West Cumberland the Rivers Ehen and Keekle have benefited from the completion of the Cleator and District sewerage scheme and the abandonment of three small overloaded sewage works. Minor streams in this area have shown marked improvement on completion of the Northern Parishes comprehensive main drainage scheme of the Ennerdale Rural District Council.

(2) Routine sampling of major rivers was carried out at quarterly intervals at the following selected non-tidal stations, and maximum, minimum and mean results of analysis are incorporated in the Appendix, pages 50-53.

| | |
|----------------|---|
| River Eden | Eden Gate, Warcop. |
| River Eden | Appleby Bridge. |
| River Eden | Bolton Bridge, below Appleby. |
| River Eamont | Udford. |
| River Eden | Langwathby Bridge. |
| River Eden | Armathwaite Bridge. |
| River Eden | Warwick Bridge. |
| River Petteril | Above River Eden confluence. |
| River Caldew | Caldewgate Bridge, Carlisle. |
| River Caldew | Above River Eden confluence (Caldewgate). |
| River Eden | Above Carlisle Sewage Works. |
| River Eden | Below Carlisle Sewage Works. |
| River Derwent | Ouse Bridge. |
| River Derwent | Cockermouth Bridge. |
| River Derwent | Ribton Hall. |
| River Derwent | Workington Bridge. |
| River Calder | Calder Bridge. |
| River Calder | Calder Hall. |
| River Ehen | Ennerdale Bridge |
| River Ehen | Wath Brow. |
| River Ehen | Kersay Bridge, South of Egremont. |
| River Ellen | Bolton Gate. |
| River Ellen | Harriston. |
| River Ellen | Ellen Villa. |
| River Ellen | Dearham Bridge. |
| River Wampool | Laythes Bridge. |
| River Waver | Bolton Low Houses. |
| River Waver | Waverbridge. |
| River Waver | New Bridge, near Abbeytown. |

The number of sampling stations has been increased to 29 as compared with 14 in the previous year.

SECTION 2—STANDARDS APPLIED TO EFFLUENTS

The following qualitative standards are used by the Authority as a basis for assessing the acceptability of discharges of effluents to non-tidal waters, although local conditions are taken into account in determining the standards to be applied to any individual discharge and variations may be introduced in circumstances such as, for example, where dilution is shown to be minimal.

1. Sewage Effluents.

(a) Works providing full primary and secondary treatment.

(i) Solids in suspension, dried at 105°C shall not exceed 30 milligrammes per litre.

(ii) Biochemical Oxygen demand, 5 days at 20°C, shall not exceed 20 milligrammes per litre.

(b) Stormwater tanks at sewage works.

Solids in suspension, dried at 105°C, shall not exceed 100 milligrammes per litre.

Additionally it is usual to require that a specific volume of sewage (often expressed as a multiple of the dry weather flow) shall pass for full treatment prior to any discharge being made.

(c) Septic tank and filter installations.

(i) Solids in suspension, dried at 105°C, shall not exceed 60 milligrammes per litre.

(ii) Biochemical oxygen demand, 5 days at 20°C, shall not exceed 40 milligrammes per litre.

2. Trade Effluents.

Effluent quality is assessed in the light of local circumstances and in consideration of the manufacturing processes involved. It is usual to limit some or all of the following:

pH value (usually within the 5 to 9 range) temperature, solids in suspension, permanganate value (4 hours), biochemical oxygen demand and toxic substances. Where appropriate it is also required that oil or grease shall not be present.

SECTION 3.—SAMPLES AND ANALYSES OF EFFLUENTS.

The year under review is the first full year in which the Authority has maintained its own analytical service, and the improved flexibility in sampling programme which has resulted has enabled a more comprehensive appraisal of local authority sewage works performance to be made.

The following table gives particulars of the number of effluent samples analysed, and the classification given on the standards quoted in Section 2, together with comparative numbers for the previous two years.

| Classification | Sewage | | | Trade | | |
|--------------------|--------|--------|--------|--------|--------|--------|
| | 1967-8 | 1966-7 | 1965-6 | 1967-8 | 1966-7 | 1965-6 |
| Satisfactory ... | 47 | 59 | 29 | 8 | 17 | 12 |
| Unsatisfactory ... | 165 | 172 | 83 | 22 | 24 | 20 |
| Not Classified ... | 44 | 12 | 7 | 10 | 10 | 5 |
| | 256 | 243 | 119 | 40 | 51 | 37 |

The samples not classified were taken at intermediate stages of treatment in order to provide information for an assessment of treatment efficiency or as a basis for improved methods of treatment. In addition 321 samples of river water and 22 samples of ground water were analysed and thus the total number of samples taken was 639, compared with 527 in 1966-7, and 394 in 1965-6.

SECTION 4—SEWAGE AND TRADE EFFLUENTS.

The connection to sewer of laundry effluent which previously discharged to river is perhaps the most significant change of discharge during the year, following the completion of the Botcherby Relief Sewer in Carlisle. Undoubtedly the commissioning of new sewage works at Cleator and Parton in Ennerdale Rural District Council's area towards the end of the period will lead to much improved effluent discharges. The Cleator works receives trade effluents from a paper mill and textile factory which contain dye wastes and there has been a noticeable improvement as regards the colour of the effluent discharged.

Thirty-three applications for consent under section 7 of the Rivers (Prevention of Pollution) Act, 1951, were received, which together with four outstanding from the previous year have been dealt with as follows:—

| | Local Authority Sewage Works | Small Sewage Works | Trade Premises |
|--|---------------------------------|-----------------------|-------------------|
| Consent granted ... | 4 | 27 | 4 |
| Consent Refused ... | — | — | — |
| Application Withdrawn | — | 2 | — |
| Awaiting determination at end of period ... | — | — | — |
| | 4 | 29 | 4 |

No appeals have been lodged with the Ministry of Housing and Local Government under Section 6 of the Rivers (Prevention of Pollution) Act, 1961.

SECTION 5.—REMEDIAL ACTION.

The following list shows the position at the end of the period under review of the more important schemes of sewerage and sewage disposal in the Authority's area.

Border Rural District Council:

Aglionby.

Brampton.

Heads Nook.

Irthington/Newtown.

Smithfield.

Walton.

Wetheral/Gt. Corby.

Works nearing completion.

Relief sewerage scheme in course of preparation.

Scheme investigated by Ministry.

Tender documents in preparation.

Outline scheme subject to revision due to land purchase difficulties.

Work in progress.

Approved by Ministry, detailed drawings in preparation.

Carlisle County Borough Council:

| | |
|----------------------------|-------------------------------------|
| Botcherby Relief Sewer. | Work completed. |
| Willow Holme Sewage Works. | New humus tanks under construction. |

Cockermouth Rural District Council:

| | |
|---------------------------|--|
| Bassenthwaite. | Small sewer extension completed. |
| Broughton/Broughton Cross | Approved by Ministry. |
| Harker Marsh. | Works abandoned on completion of pumping schemes to Dearham. |
| Prospect/Oughterside. | Proposed reconstruction scheme delayed. |
| Seatoller. | Scheme approved by Ministry. |

Cockermouth Urban District Council:

| | |
|---------------------|--|
| Main Outfall Sewer. | Scheme of reconstruction of part of main sewer in preparation. |
|---------------------|--|

Ennerdale Rural District Council:

| | |
|-----------------------|-----------------------|
| Cleator and District. | New works completed.. |
| Northern Parishes. | New works completed.. |
| St. Bees. | New works completed.. |

North Westmorland Rural District Council:

| | |
|---------------------------------------|--|
| Clifton. | Scheme delayed due to motorway service area proposals. |
| Kirkby Thore. | Submitted to Ministry. |
| Morland. | Approved in principle but deferred due to economic position. |
| Ravenstonedale/ Newbiggin on Lune: | New works completed. |
| Shap. | Scheme approved by Council but deferred due to financial position. |

Penrith Rural District Council:

| | |
|--------------------------|--|
| Ainstable. | Scheme deferred. |
| Catterlen/Newton Reigny. | Scheme in preparation. |
| Greystoke. | Consultants instructed to prepare scheme. |
| Langwathby. | Scheme in preparation. |
| Lazonby/Kirkoswald. | Work in progress. |
| Melmerby. | Scheme investigated by Ministry and approved in principle. Details in preparation. |
| Motherby/Penruddock. | Scheme in preparation. |
| Skirwith. | Work in progress. |
| Stainton/Newbiggin. | Work completed. |
| Threlkeld. | Scheme subject to revision. |

Wigton Rural District Council:

Blencogo, Bromfield and
Langrigg.

Scheme deferred.

Caldbeck/Hesket-New-
Market.

Scheme deferred.

Fletcherstown.

Scheme for reconstruction in pre-
paration.

Once again the lack of progress in bringing to fruition the much delayed and urgently needed improvements in the Wigton Rural District Council's Aspatia sewage works has caused concern to the Authority. The scheme was prepared by Consulting Engineers in December 1965 but the Council and the Milk Marketing Board had not agreed financial terms for trade effluent treatment at the end of the year.

SECTION 6. STATISTICS RELATING TO POLLUTION CONTROL.

TABLE 1. DISCHARGES INTO STREAMS REQUIRING CONSENT
UNDER SECTION 7 OF THE 1951 ACT.

| | Consents and notices issued during year | Refusals during year |
|--|---|----------------------------|
| (a) Effluents from local authority sewage disposal works and other domestic sewage effluents ... | 29 | — |
| (b) Effluents from storm sewage overflows and storm sewage tanks | 4 | — |
| (c) Effluents from trade premises ... | 2 | — |
| (d) Farm effluents | 1 | — |
| Total | 36 | — |

TABLE 2. DISCHARGES INTO TIDAL WATERS REQUIRING CONSENT
UNDER SECTION 7 OF THE 1951 ACT AS EXTENDED BY
SECTION 1 OF THE 1960 ACT.

| | Consents and notices issued during year | Refusals during year |
|--|---|----------------------------|
| (a) Effluents from local authority sewage disposal works and other domestic sewage effluents ... | — | — |
| (b) Effluents from storm sewage overflows and storm sewage tanks | — | — |
| (c) Effluents from trade premises | — | — |
| (d) Farm effluents | 1 | — |
| Total | 1 | — |

TABLE 3. REVIEW OF CONDITIONS OF CONSENT UNDER SECTION 5 OF THE 1961 ACT.

| | Consents reviewed and variations issued during year |
|--|---|
| (a) Effluents from local authority sewage disposal works and other domestic sewage effluents ... | 1 |
| (b) Effluents from storm sewage overflows and storm sewage tanks | 1 |
| (c) Effluents from trade premises ... | 1 |
| (d) Farm effluents | — |
| Total | 3 |

TABLE 4. DISCHARGES INTO UNDERGROUND STRATA REQUIRING CONSENT UNDER SECTION 72 OF THE 1963 ACT.

No consents were granted or refused during the year.

SECTION 7. RESEARCH.

No research has been undertaken during the past 12 months.

RESULTS OF ANALYSIS OF RIVER WATERS, APRIL 1967 to MARCH 1968

Chemical Results in p.p.m.

50

| Location | | Temp °C. | pH | Total Solids | Susp. Solids | Per- manganate Value (4 hrs) | B.O.D. (5 days) | NH3 N | Chlo- rion Cl. | Alkalinity as CaCO3 to m.o. | Hardness as Total Calcium | CaCO3 Magnesium | Dissolved Oxygen saturation | |
|----------------------------------|------|-------------|-----|-----------------|-----------------|---------------------------------------|--------------------|----------|----------------------|--------------------------------------|------------------------------|--------------------|-----------------------------------|-------|
| River Eden, Warcop | max. | 14.7 | 8.2 | 448 | 18 | 3.55 | 1.6 | 0.23 | 18 | 240 | 228 | 166 | 64 | 103 |
| | min. | 5.0 | 8.1 | 227 | 4 | 1.05 | 0.9 | 0.10 | 14 | 182 | 144 | 112 | 32 | 93 |
| | mean | 8.8 | 8.2 | 337 | 13 | 1.98 | 1.3 | 0.15 | 15 | 211 | 192 | 147 | 45 | 99 |
| River Eden, Appleby. | max. | 14.8 | 8.2 | 424 | 15 | 4.05 | 2.2 | 0.26 | 18 | 220 | 286 | 166 | 68 | 104 |
| | min. | 5.0 | 8.1 | 225 | 3 | 1.15 | 1.3 | 0.12 | 14 | 190 | 146 | 104 | 42 | 95 |
| | mean | 8.8 | 8.1 | 330 | 9 | 2.25 | 1.8 | 0.16 | 16 | 209 | 197 | 140 | 57 | 98 |
| River Eden, Bolton | max. | 15.2 | 8.3 | 492 | 19 | 4.05 | 1.6 | 0.20 | 18 | 210 | 222 | 164 | 66 | 110 |
| | min. | 5.0 | 8.1 | 232 | 1 | 0.95 | 1.2 | 0.07 | 14 | 106 | 136 | 108 | 22 | 94 |
| | mean | 9.1 | 8.2 | 349 | 11 | 2.18 | 1.4 | 0.16 | 17 | 170 | 183 | 142 | 41 | 102.2 |
| River Eamont | max. | 15.4 | 8.4 | 158 | 18 | 2.25 | 2.1 | 0.13 | 17 | 72 | 80 | 60 | 20 | 116 |
| | min. | 3.0 | 8.0 | 95 | 4 | 1.05 | 0.9 | 0.05 | 10 | 46 | 48 | 36 | 10 | 92 |
| | mean | 8.5 | 8.3 | 125 | 11 | 1.42 | 1.4 | 0.09 | 13 | 62 | 65.5 | 51 | 15 | 101 |
| River Eden, Langwathby | max. | 15.4 | 8.3 | 308 | 27 | 2.60 | 2.0 | 0.20 | 16 | 166 | 152 | 110 | 48 | 108 |
| | min. | 5.0 | 8.0 | 172 | 4 | 1.10 | 0.9 | 0.07 | 11 | 98 | 96 | 64 | 6 | 92 |
| | mean | 9.1 | 8.2 | 236 | 15 | 1.67 | 1.3 | 0.13 | 15 | 125 | 122.8 | 94 | 29 | 101 |
| River Eden, Armathwaite | max. | 15.4 | 8.3 | 344 | 17 | 2.55 | 2.3 | 0.16 | 18 | 116 | 144 | 100 | 46 | 114 |
| | min. | 4.0 | 7.8 | 175 | 4 | 0.95 | 0.7 | 0.05 | 10 | 94 | 84 | 76 | 8 | 91 |
| | mean | 9.3 | 8.1 | 232 | 8 | 1.67 | 1.4 | 0.11 | 14 | 105 | 118.5 | 93 | 26 | 101 |
| River Eden, Warwick Bridge | max. | 15.5 | 8.6 | 332 | 15 | 3.05 | 2.0 | 0.16 | 20 | 130 | 138 | 104 | 36 | 125 |
| | min. | 3.0 | 7.9 | 166 | 4 | 0.85 | 0.9 | 0.05 | 12 | 96 | 84 | 72 | 12 | 93 |
| | mean | 9.5 | 8.2 | 223 | 9 | 1.75 | 1.6 | 0.10 | 15 | 116 | 120 | 93.5 | 26 | 103 |

| Location | | Temp. °C. | pH | Total Solids | Susp. Solids | Per- manganate Value (4 hrs) | B.O.D. (5 days) | NH3 N | Chlo- rion Cl. | Alkalinity as CaCO3 to m.o. | Hardness as Total Calcium | CaCO3 Magnesium | Dissolved Oxygen saturation | |
|---|------|--------------|-----|-----------------|-----------------|---------------------------------------|--------------------|----------|----------------------|-----------------------------------|------------------------------|--------------------|-----------------------------------|-----|
| River Petteril | max. | 15.6 | 8.8 | 536 | 38 | 3.95 | 6.7 | 0.33 | 28 | 200 | 204 | 196 | 54 | 158 |
| | min. | 9.0 | 7.9 | 295 | 3 | 1.80 | 2.6 | 0.07 | 12 | 168 | 200 | 146 | 4 | 87 |
| | mean | 11.1 | 8.3 | 429 | 14 | 2.49 | 4.4 | 0.21 | 20 | 183 | 202 | 167 | 35 | 121 |
| River Caldew, Caldewgate | max | 16.4 | 8.9 | 252 | 17 | 2.75 | 3.2 | 0.33 | 19 | 124 | 142 | 110 | 50 | 122 |
| | min. | 7.0 | 8.0 | 162 | 8 | 1.70 | 2.8 | 0.13 | 13 | 104 | 96 | 84 | 12 | 91 |
| | mean | 10.3 | 8.3 | 213 | 13 | 2.14 | 3.0 | 0.23 | 16 | 111 | 126 | 91 | 35 | 104 |
| River Caldew, Caldewfoot | max. | 16.5 | 8.8 | 360 | 24 | 5.20 | 10.4 | 0.20 | 18 | 128 | 142 | 92 | 50 | 104 |
| | min. | 7.0 | 7.9 | 185 | 8 | 1.70 | 2.9 | 0.13 | 15 | 104 | 100 | 80 | 20 | 90 |
| | mean | 10.4 | 8.3 | 246 | 14 | 2.91 | 5.3 | 0.16 | 17 | 118 | 123 | 89 | 33 | 98 |
| River Eden, above Carlisle S. Works | max. | 16.4 | 8.3 | 330 | 18 | 4.55 | 6.2 | 0.30 | 19 | 128 | 146 | 104 | 42 | 123 |
| | min. | 6.0 | 7.8 | 219 | 7 | 1.70 | 2.4 | 0.08 | 14 | 92 | 80 | 72 | 8 | 86 |
| | mean | 10.2 | 8.1 | 262 | 13 | 2.66 | 3.4 | 0.16 | 16 | 114 | 125 | — | 29 | 100 |
| River Eden, below Carlisle S. Works | max. | 16.9 | 8.1 | 404 | 20 | 7.80 | 6.7 | 0.66 | 20 | 124 | 150 | 108 | 44 | 114 |
| | min. | 7.2 | 7.8 | 212 | 12 | 2.80 | 3.1 | 0.12 | 16 | 96 | 84 | 60 | 24 | 84 |
| | mean | 10.9 | 8.0 | 282 | 15 | 4.46 | 4.2 | 0.35 | 18 | 112 | 127 | 94 | 32 | 96 |
| River Derwent Ouse Bridge | max. | 15.2 | 7.7 | 98 | 20 | 2.40 | 1.9 | 0.16 | 17 | 30 | 28 | 22 | 12 | 100 |
| | min. | 3.4 | 7.2 | 56 | 2 | 1.20 | 1.0 | 0.05 | 12 | 24 | 20 | 12 | 4 | 89 |
| | mean | 8.8 | 7.5 | 73 | 9 | 1.88 | 1.4 | 0.09 | 15 | 27 | 25 | 17 | 8 | 96 |
| River Derwent, Cockermouth | max. | 15.0 | 7.8 | 110 | 15 | 2.90 | 1.6 | 0.08 | 16 | 34 | 26 | 18 | 16 | 110 |
| | min. | 3.6 | 7.2 | 64 | 3 | 0.80 | 1.1 | 0.03 | 12 | 18 | 12 | 10 | 4 | 90 |
| | mean | 8.8 | 7.5 | 85 | 8 | 1.60 | 1.4 | 0.07 | 14 | 26 | 22 | 14 | 8 | 98 |

| Location | | Temp. °C. | pH | Total Solids | Susp. Solids | Per- manganate Value (4 hrs) | B.O.D. (5 days) | NH ₃ N | Chlo- rion Cl. | Alkalinity as CaCO ₃ to m.o. | Hardness Total | as Calcium | CaCO ₃ Magnesium | Dissolved Oxygen saturation |
|----------------|-----------------|--------------|-----|-----------------|-----------------|---------------------------------------|--------------------|----------------------|----------------------|---|-------------------|---------------|--------------------------------|-----------------------------------|
| River Derwent, | max. | 14.6 | 7.4 | 110 | 14 | 2.8 | 2.2 | 0.08 | 18 | 36 | 42 | 30 | 16 | 109 |
| | Ribton min. | 3.6 | 7.2 | 78 | 2 | 1.3 | 1.1 | 0.07 | 13 | 29 | 28 | 20 | 6 | 93 |
| | Hall mean | 8.8 | 7.4 | 94 | 7 | 1.8 | 1.7 | 0.07 | 15 | 34 | 35 | 24 | 11 | 99 |
| | max. | 14.6 | 7.6 | 142 | 15 | 2.5 | 7.3 | 0.16 | 20 | 62 | 70 | 54 | 16 | 106 |
| | Workington min. | 3.7 | 6.9 | 94 | 3 | 0.7 | 0.7 | 0.05 | 13 | 30 | 31 | 24 | 5 | 92 |
| | mean | 8.8 | 7.3 | 118 | 9 | 1.7 | 2.9 | 0.09 | 19 | 42 | 46 | 35 | 11 | 98 |
| | max. | 13.1 | 7.7 | 96 | 12 | 4.2 | 1.5 | 0.33 | 18 | 34 | 34 | 24 | 13 | 98 |
| | Calder min. | 2.5 | 6.9 | 41 | 3 | 0.8 | 1.2 | 0.07 | 10 | 12 | 22 | 17 | 10 | 96 |
| | Bridge mean | 7.5 | 7.3 | 66 | 8 | 2.9 | 1.4 | 0.16 | 14 | 24 | 29 | 18 | 11 | 97 |
| | max. | 13.2 | 7.8 | 113 | 12 | 3.7 | 1.4 | 0.20 | 17 | 34 | 34 | 28 | 8 | 100 |
| | Calder min. | 2.5 | 6.8 | 27 | 3 | 0.7 | 0.7 | 0.05 | 11 | 18 | 20 | 12 | 6 | 95 |
| | Hall mean | 7.5 | 7.2 | 69 | 8 | 2.4 | 1.0 | 0.11 | 14 | 25 | 25 | 18 | 7 | 97 |
| | max. | 14.0 | 7.7 | 115 | 13 | 1.8 | 2.3 | 0.16 | 13 | 25 | 58 | 40 | 18 | 109 |
| | Ennerdale min. | 2.5 | 6.5 | 90 | 4 | 0.6 | 0.6 | 0.02 | 11 | 15 | 15 | 6 | 9 | 93 |
| | Bridge mean | 8.3 | 7.3 | 98 | 9 | 1.2 | 1.1 | 0.08 | 12 | 21 | 34 | 22 | 12 | 98 |
| | max. | 14.0 | 7.6 | 140 | 9 | 1.0 | 1.5 | 0.12 | 14 | 38 | 60 | 46 | 14 | 106 |
| | Wath Brow min. | 3.0 | 6.6 | 98 | 4 | 0.6 | 0.6 | 0.02 | 12 | 16 | 29 | 22 | 6 | 94 |
| | mean | 8.5 | 7.2 | 111 | 7 | 0.8 | 1.0 | 0.07 | 14 | 27 | 38 | 30 | 8 | 97 |
| River Ehen | max. | 14.1 | 7.8 | 165 | 26 | 3.2 | 2.2 | 0.59 | 21 | 80 | 98 | 84 | 20 | 103 |
| | Kersey min. | 3.0 | 6.8 | 115 | 7 | 1.1 | 1.3 | 0.07 | 14 | 41 | 56 | 39 | 10 | 91 |
| | Bridge mean | 8.6 | 7.4 | 135 | 15 | 2.00 | 1.9 | 0.32 | 17 | 58 | 73 | 57 | 15 | 96 |

| Location | | Temp. °C. | pH | Total Solids | Susp. Solids | Per- manganate Value (4 hrs) | B.O.D. (5 days) | NH3 N | Chlo- rion Cl. | Alkalinity as CaCO3 to m.o. | Total Hardness as Calcium | CaCO3 Magnesium | Dissolved Oxygen saturation | |
|--------------------------------------|------|--------------|-----|-----------------|-----------------|---------------------------------------|--------------------|----------|----------------------|-----------------------------------|---------------------------------|--------------------|-----------------------------------|-----|
| River Ellen, Bolton Gate | max. | 13.8 | 8.4 | 280 | 15 | 2.60 | 1.6 | 0.33 | 19 | 190 | 160 | 152 | 22 | 104 |
| | min. | 5.0 | 7.9 | 189 | 3 | 0.35 | 0.8 | 0.15 | 14 | 110 | 122 | 100 | 8 | 90 |
| | mean | 8.8 | 8.1 | 229 | 7 | 1.61 | 1.2 | 0.24 | 17 | 152 | 143 | 126 | 17 | 95 |
| River Ellen, Harriston | max. | 14.2 | 8.4 | 301 | 15 | 4.40 | 1.9 | 0.26 | 21 | 184 | 190 | 146 | 46 | 110 |
| | min. | 5.1 | 8.0 | 214 | 7 | 1.10 | 1.0 | 0.10 | 16 | 150 | 140 | 124 | 14 | 93 |
| | mean | 8.9 | 8.1 | 264 | 12 | 2.40 | 1.4 | 0.17 | 18 | 165 | 159 | 134 | 25 | 99 |
| River Ellen, Ellen Villa | max. | 14.6 | 8.4 | 392 | 19 | 4.50 | 4.7 | 0.40 | 26 | 188 | 192 | 164 | 72 | 106 |
| | min. | 5.3 | 7.9 | 290 | 6 | 1.40 | 2.3 | 0.16 | 16 | 150 | 164 | 120 | 6 | 87 |
| | mean | 9.1 | 8.1 | 317 | 14 | 2.64 | 2.9 | 0.32 | 20 | 172 | 179 | 144 | 35 | 96 |
| River Ellen, Dearham | max. | 14.6 | 8.4 | 427 | 32 | 5.70 | 4.6 | 0.43 | 28 | 184 | 188 | 172 | 82 | 95 |
| | min. | 5.2 | 7.7 | 312 | 6 | 1.30 | 1.4 | 0.13 | 18 | 152 | 168 | 104 | 8 | 88 |
| | mean | 9.1 | 8.0 | 350 | 18 | 3.08 | 2.9 | 0.28 | 23 | 171 | 180 | 140 | 41 | 91 |
| River Wampool, Laythes | max. | 15.0 | 8.0 | 406 | 34 | 8.15 | 5.2 | 2.14 | 30 | 166 | 180 | 118 | 72 | 89 |
| | min. | 4.1 | 7.5 | 221 | 5 | 4.10 | 1.2 | 0.73 | 20 | 110 | 144 | 94 | 44 | 68 |
| | mean | 8.8 | 7.9 | 299 | 21 | 5.89 | 2.9 | 1.12 | 25 | 134 | 160 | 103 | 58 | 75 |
| River Waver, Bolton Low Houses | max. | 14.8 | 8.4 | 339 | 19 | 3.70 | 1.8 | 0.43 | 20 | 164 | 170 | 144 | 40 | 96 |
| | min. | 3.2 | 7.9 | 182 | 4 | 1.80 | 1.1 | 0.15 | 16 | 148 | 124 | 104 | 20 | 83 |
| | mean | 8.1 | 8.2 | 254 | 10 | 2.53 | 1.5 | 0.27 | 18 | 155 | 154 | 127 | 27 | 89 |
| River Waver, Waverbridge | max. | 15.2 | 8.4 | 450 | 141 | 6.30 | 2.0 | 0.50 | 23 | 160 | 176 | 140 | 48 | 98 |
| | min. | 3.4 | 7.8 | 181 | 4 | 1.70 | 1.4 | 0.13 | 16 | 144 | 126 | 104 | 20 | 84 |
| | mean | 8.9 | 8.1 | 287 | 55 | 3.68 | 1.8 | 0.29 | 19 | 154 | 157 | 125 | 31 | 92 |
| River Waver, Abbeytown | max. | 14.8 | 8.2 | 364 | 46 | 10.20 | 4.0 | 1.07 | 27 | 161 | 162 | 134 | 42 | 109 |
| | min. | 3.4 | 7.5 | 246 | 7 | 5.10 | 2.0 | 0.53 | 20 | 116 | 128 | 104 | 6 | 74 |
| | mean | 8.7 | 8.0 | 305 | 33 | 7.15 | 2.7 | 0.76 | 23 | 136 | 140 | 116 | 24 | 87 |

PART VII

OTHER GENERAL INFORMATION

SECTION 1. RECREATIONAL FACILITIES

The Authority has not provided or otherwise made available any recreational facilities on inland waters. Sailing, boating, water ski-ing, canoeing swimming, and angling are already established in the area.

PART VIII

INFORMATION ABOUT EXPENDITURE AND INCOME

PART VIII: INFORMATION

Statement of Income and Expenditure on Loan and TABLE

WATER

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Capital Transactions:— | | | |
| Grant Aided Works—Hydrometric Works (For details see Table 3) | 4,427 | 4,260 | 8,687 |
| Non-Grant Aided Works — Hydrometric Works (For details see Table 3) ... | — | — | — |
| Water Conservation Works (For details see Table 3) | — | 27,602 | 27,602 |
| Other Items (For details see Table 3) ... | 1,243 | — | 1,243 |
| | 5,670 | 31,862 | 37,532 |
| Revenue Transactions:— | | | |
| Maintenance of Works | 4,335 | — | 4,335 |
| Administrative Charges — | | | |
| Staff Salaries, Insurance and | | | |
| Superannuation | 20,220 | | |
| Travelling, Subsistence, etc. ... | 2,231 | | |
| Consultant's Fees | 1,623 | | |
| Carried forward | 34,079 | 31,862 | 41,867 |

ABOUT EXPENDITURE AND INCOME

Revenue Accounts—Year ended 31st March, 1968

1

RESOURCES

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|---|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| INCOME | | | | | | | |
| Capital Transactions:— | | | | | | | |
| Grant Aided Works— | | | | | | | |
| Loans Raised | ... | ... | ... | ... | | 3,350 | 3,350 |
| Exchequer Grant | ... | ... | ... | ... | 4,344 | | 4,344 |
| | | | | | | | |
| Water Conservation Works | ... | ... | | | | 20,000 | 20,000 |
| | | | | | | | |
| | | | | | 4,344 | 23,350 | 27,694 |
| | | | | | | | |
| Revenue Transactions:— | | | | | | | |
| Licence Fees | ... | ... | ... | ... | 1,644 | | |
| Interim Charges | ... | ... | ... | ... | 232 | | 1,876 |
| Contributions from other accounts under | | | | | | | |
| Section 83(2)(b) of the Water | | | | | | | |
| Resources Act, 1963 | | | | | | | |
| Land Drainage | ... | ... | ... | ... | 500 | | |
| Fisheries and Water Recreation | ... | | | ... | 250 | | 750 |
| | | | | | | | |
| Carried forward | ... | ... | ... | ... | 6,970 | 23,350 | 30,320 |

Statement of Income and Expenditure on

TABLE 1—

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Brought forward | 34,079 | 31,862 | 41,867 |
| Office Expenses (Drawing Office Supplies £112; Furniture & Equipment £509; Printing, Stationery and Advertising £364; Surveying Equipment £120) ... | 1,105 | | 25,179 |
| Legal Charges | 40 | | 40 |
| Other Items (Expenses Re. Charging Scheme £193; Subscription £250; Miscellaneous £95) | 538 | | |
| Proportion of General Administrative Charges | 2,950 | | 3,488 |
| General Charges | 46 | | 46 |
| <hr/> | | | |
| Total—WATER RESOURCES ... | 38,758 | 31,862 | 70,620 |
| BALANCE—Income in excess of Expendi- ture for the year | 8,730 | | 8,730 |
| <hr/> | | | |
| | 47,488 | 31,862 | 79,350 |
| <hr/> | | | |

Loan and Revenue Accounts—Continued
Continued

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| INCOME | | | |
| Brought forward | 6,970 | 23,350 | 30,320 |
| Other Income | 66 | | 66 |
| Precepts— Councils of Counties and County Boroughs (For details see Table 5) ... | 40,452 | | 40,452 |
| <hr/> | | | |
| Total—WATER RESOURCES | 47,488 | 23,350 | 70,838 |
| BALANCE—Expenditure in excess of Income for the year | | 8512 | 8,512 |
| <hr/> | | | |
| | 47,488 | 31,862 | 79,350 |
| <hr/> | | | |

PART VIII: INFORMATION ABOUT EXPENDITURE

Statement of Income and Expenditure on Loan and

TABLE

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|---|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| LAND DRAINAGE | | | |
| Capital Transactions:— | | | |
| Grant Aided Works, etc. (For details see Table 4) | 1,853 | 4,383 | 6,236 |
| Non-Grant Aided Works, etc. (For details see Table 4) | 6,709 | 4,300 | 11,009 |
| | | | |
| | 8,562 | 8,683 | 17,245 |
| Revenue Transactions:— | | | |
| New Works & Impt. Schemes— | | | |
| Loan Charges— | | | |
| Principal Repaid | 13,490 | | |
| Interest | 4,919 | | 18,409 |
| Maintenance of Works— | | | |
| Watercourses | 49,944 | | 49,944 |
| Contributions to Water Resources Account under Section 83(2)(b) of the Water Resources Act, 1963 | 500 | | 500 |
| Contributions to Internal Drainage Boards | — | | — |
| Salaries etc. Rechargeable to Internal Drainage Boards | 2,831 | | 2,831 |
| | | | |
| Carried forward | 80,246 | 8,683 | 88,929 |

AND INCOME (OTHER THAN FOR WATER RESOURCES)
and Revenue Accounts—Year ended 31st March, 1968

2

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|---|-------------------------|----------------------|---------------------|
| INCOME | | | |
| LAND DRAINAGE | | | |
| Capital Transactions:— | | | |
| Grant Aided Works— | | | |
| Loan Raised | | 7,300 | 7,300 |
| Contributions from Local Authys., Private Frontages etc. | — | | — |
| Exchequer Grant—Schemes financed from Revenue | 1,019 | | 1,019 |
| Non-Grant Aided Works | | | |
| Sale of Motor Vehicles and Heavy Plant | 853 | | 853 |
| | 1,872 | 7,300 | 9,172 |
| Revenue Transactions:— | | | |
| New Works & Impt. Schemes— | | | |
| Exchequer Grant towards Loan Charges | 13,596 | | 13,596 |
| Maintenance of Works— | | | |
| Contr. from Local Authys., Private Frontages, etc. | 75 | | 75 |
| Rechargeable Items— | | | |
| Recovered by Percentage on Cost of Rechargeable Works | 89 | | |
| Charged to Internal Drainage Boards administered by the Authority | 3,460 | | 3,549 |
| Carried forward | 19,092 | 7,300 | 26,392 |

Statement of Income and Expenditure on

TABLE 2—

| | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|-------------------------------|-----|-----|---------------|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | | | | |
| Brought forward | ... | ... | ... | 80,246 | 8,683 | 88,929 |
| Subsidiary Accounts— | | | £ | | | |
| Motor Transport & Plant— | | | | | | |
| Maintenance & | | | | | | |
| Operating Costs | ... | ... | 7,518 | | | |
| Loan Charges— | | | | | | |
| Principal | ... | ... | 246 | | | |
| Interest | ... | ... | 81 | | | |
| Debit Balance on:— | | | | | | |
| Stores Oncost | ... | ... | 52 | | | |
| | | | <u>7,897</u> | | | |
| Deduct— | | | | | | |
| Motor Transport & Plant— | | | | | | |
| Hiring Charges | ... | ... | 12,770 | | | |
| Credit Balance— | | | | | | |
| Light Plant, Tools | | | | | | |
| & Equipment | ... | ... | 17 | | | |
| Oncost | ... | ... | 498 | | | |
| Rebate on Purchases | ... | ... | 6 | | | |
| | | | <u>13,291</u> | Cr. 5,394 | | Cr. 5,394 |
| Estates— | | | | | | |
| Rent, Rates & Ins. £259 | } | ... | ... | 492 | | 492 |
| Repairs & Renewals £233 | | | | | | |
| Administrative Charges— | | | | | | |
| Staff Salaries, Insurance | | | | | | |
| & Superannuation | ... | ... | ... | 12,883 | | |
| Travelling, Subsistence, etc. | ... | ... | ... | 1,194 | | |
| Office Accommodation | ... | ... | ... | — | | |
| Carried forward | ... | ... | ... | 89,421 | 8,683 | 84,027 |

Loan and Revenue Accounts—Continued
Continued

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|-----------------|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| INCOME | | | | | | | |
| Brought forward | ... | ... | ... | ... | 19,092 | 7,300 | 26,392 |

| | | | | | | | |
|-----------------|-----|-----|-----|--|--------|-------|--------|
| Carried forward | ... | ... | ... | | 19,092 | 7,300 | 26,392 |
|-----------------|-----|-----|-----|--|--------|-------|--------|

Statement of Income and Expenditure on

TABLE 2—

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Brought forward | 89,421 | 8,683 | 84,027 |
| Office Expenses (Engineer's Requisites £87; Furniture & Equipment £157; Print- ing, Stationery & Advertising £167; Postages £15; Telephones £127) ... | 553 | | |
| Legal Charges | 6 | | |
| Proportion of General Administrative Charges | 2,271 | | 16,907 |
| General Charges | 36 | | 36 |
| Other Items — Supplementary Pension Allowance | 63 | | |
| — Additional Retirement Grant | 97 | | |
| — Main River & Other Surveys | 161 | | |
| — Other Items | 8 | | 329 |
| Total—LAND DRAINAGE | 92,616 | 8,683 | 101,299 |
| FISHERIES & WATER RECREATION | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works (For details see Table 4) | 276 | | 276 |
| | 276 | | 276 |
| Revenue Transactions:— | | | |
| Hatchery | 1,190 | | 1,190 |
| Water Bailiffs & Inspectorate— Wages, Nat. Ins. & Superan. | 11,453 | | |
| Travelling, Subsistence, etc. | 906 | | |
| Carried forward | 13,825 | | 1,466 |
| Carried forward | 92,616 | 8,683 | 101,299 |

Loan and Revenue Accounts—Continued
Continued

| INCOME | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|-----------------------------------|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| Brought forward | ... | ... | ... | ... | 19,092 | 7,300 | 26,392 |
| Total—LAND DRAINAGE | | | | | 19,092 | 7,300 | 26,392 |
| FISHERIES & WATER RECREATION | | | | | | | |
| Capital Transactions:— | | | | | | | |
| Non-Grant Aided Works | ... | ... | | | — | | — |
| | | | | | — | | — |
| Revenue Transactions:— | | | | | | | |
| Fishing Licences— | | | | | | | |
| Salmon & Migratory Trout | ... | ... | | | 11,732 | | |
| Trout (including Migratory Trout) | ... | | | | 6,288 | | |
| Carried forward | ... | ... | ... | ... | 18,020 | | — |
| Carried forward | ... | ... | ... | ... | 19,092 | 7,300 | 26,392 |

Statement of Income and Expenditure on

TABLE 2—

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|---|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Brought forward | 92,616 | 8,683 | 101,299 |
| Brought forward | 13,825 | | 1,466 |
| Cottages—Rents & Rates | 69 | | |
| Medical Exams. & Interview & Removal Expenses | 101 | | |
| Requisites | 45 | | |
| Transport—Maintenance & Operating Costs | 641 | | 13,215 |
| Maintenance & Development of Fisheries | 135 | | |
| Surveys | 37 | | 172 |
| Fish Disease | 6 | | 6 |
| Equipment | 91 | | |
| Radio Equipment | 132 | | 223 |
| Contribution to Water Resources | | | |
| Account under Section 83(2)(b) of the Water Resources Act, 1963 | 250 | | 250 |
| Administrative Charges— | | | |
| Staff Salaries, Insurance and Superannuation | 8,270 | | |
| Travelling Subsistence etc. | 957 | | |
| Office Furniture and Equipment | 119 | | |
| Office Expenses— | | | |
| Postages & Telephones £431) | | | |
| Printing Stationery &) | 708 | | 10,054 |
| Advertising £277) | | | |
| Legal & Parliamentary Expenses etc:— | | | |
| Prosecution | 291 | | 291 |
| Other Items— | | | |
| Commission on Licences | 669 | | |
| Insurances £74; Subscriptions) | | | |
| £7; Miscellaneous £23) | 104 | | |
| Proportion of General Adminis- trative Charges | 1,207 | | 1,980 |
| Carried forward | 27,657 | | 27,657 |
| Carried forward | 92,616 | 8,683 | 101,299 |

Continued

| | | | | | | |
|-----------------|-----|-----|-----|--------|-------|--------|
| Carried forward | ... | ... | ... | 18,887 | | 18,887 |
| Carried forward | ... | ... | ... | 19,092 | 7,300 | 26,392 |

Statement of Income and Expenditure on

TABLE 2—

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|---|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Brought forward | 92,616 | 8,683 | 101,299 |
| Brought forward | 27,657 | | 27,657 |
| General Charges | 19 | | 19 |
| Other Items—Contribution re Manchester Water Order | 100 | | |
| Proposed New Licence Duties | 560 | | 660 |
| <hr/> | | | |
| Total—FISHERIES & WATER RECREATION | 28,336 | | 28,336 |
| <hr/> | | | |
| POLLUTION PREVENTION | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works (For details see Table 4) | — | | — |
| <hr/> | | | |
| Revenue Transactions:— | | | |
| Laboratories— | | | |
| Rent | 400 | | |
| Salaries, Insurance & Superannuation | 1,524 | | |
| Equipment | 396 | | |
| Other Items | 14 | | 2,334 |
| Analysts' Fees | — | | — |
| <hr/> | | | |
| Administrative Charges— | | | |
| Salaries, Insurance & Superannuation | 5,778 | | |
| Travelling, Subsistence etc. | 1,206 | | |
| Office Accommodation | 8 | | |
| Office Expenses | 92 | | |
| <hr/> | | | |
| Carried forward | 9,418 | | 2,334 |
| Carried forward | 120,952 | 8,683 | 129,635 |

Loan and Revenue Accounts—Continued
Continued

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|-----------------|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| INCOME | | | | | | | |
| Brought forward | ... | ... | ... | ... | 19,092 | 7,300 | 26,392 |
| Brought forward | ... | ... | ... | ... | 18,887 | | 18,887 |

| | | | | | | | |
|---------------------------------------|-----|-----|-----|--|--------|--|--------|
| Total—FISHERIES & WATER RECREATION | ... | ... | ... | | 18,887 | | 18,887 |
|---------------------------------------|-----|-----|-----|--|--------|--|--------|

POLLUTION PREVENTION

Capital Transactions:—

| | | | | | | |
|-----------------------|-----|-----|--|---|--|---|
| Non-Grant Aided Works | ... | ... | | — | | — |
|-----------------------|-----|-----|--|---|--|---|

Revenue Transactions:—

| | | | | | | |
|-----------------|-----|-----|-----|--------|-------|--------|
| Carried forward | ... | ... | ... | — | | — |
| Carried forward | ... | ... | ... | 37,979 | 7,300 | 45,279 |

Statement of Income and Expenditure on

TABLE 2—

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | | | | | |
| Brought forward | ... | ... | ... | ... | 120,952 | 8,683 | 129,635 |
| Brought forward | ... | ... | ... | ... | 9,418 | | 2,334 |
| Legal Charges | ... | ... | ... | ... | — | | |
| Other Items | ... | ... | ... | ... | 16 | | |
| Proportion of General Administrative Charges | ... | ... | ... | ... | 1,065 | | 8,165 |
| General Charges | ... | ... | ... | ... | 17 | | |
| Other Items | ... | ... | ... | ... | — | | 17 |
| Total—POLLUTION PREVENTION | | | | | 10,516 | | 10,516 |
| GENERAL CHARGES | | | | | | | |
| Subscriptions | ... | ... | ... | ... | 223 | | |
| Members' Allowances & Chairman's Remuneration | ... | ... | ... | ... | 973 | | |
| Insurances | ... | ... | ... | ... | 60 | | |
| Audit Stamp Duty | ... | ... | ... | ... | 220 | | |
| Other Items:— Miscellaneous | ... | ... | ... | ... | 17 | | 1,493 |
| Total—GENERAL CHARGES | | | | | 1,493 | | 1,493 |
| Carried forward | ... | ... | ... | ... | 132,961 | 8,683 | 141,644 |

Loan and Revenue Accounts—Continued
Continued

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|-----------------|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| INCOME | | | | | | | |
| Brought forward | ... | ... | ... | ... | 37,979 | 7,300 | 45,279 |
| Brought forward | ... | ... | ... | ... | — | | — |

Total—POLLUTION PREVENTION ...

GENERAL CHARGES

| | | | | | | |
|-----------------------------------|-----|-----|-----|--------|-------|--------|
| Interest—Bank | ... | ... | ... | 1,235 | | |
| Assisted Car Purchase Scheme | | | | 93 | | |
| Loan to Internal Drainage | | | | | | |
| Board | ... | ... | ... | 47 | | |
| Allocation to Main Services etc., | | | | | | |
| Water Resources | ... | ... | ... | 46 | | |
| Land Drainage | ... | ... | ... | 36 | | |
| Fisheries & Water Recreation | | | ... | 19 | | |
| Pollution Prevention | ... | ... | ... | 17 | | 1,493 |
| Total—GENERAL CHARGES | | | ... | 1,493 | | 1,493 |
| Carried forward | ... | ... | ... | 39,472 | 7,300 | 46,772 |

Statement of Income and Expenditure on

TABLE 2—

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | |
| Brought forward | 132,961 | 8,683 | 141,644 |
| GENERAL ADMINISTRATIVE CHARGES (not directly allocated to Services) | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works (for details see Table 4) | 2,824 | | 2,824 |
| | 2,824 | | 2,824 |
| Revenue Transactions:— | | | |
| Office Accommodation | | | |
| Rents & Rates £611; Heating) | | | |
| Lighting & Cleaning £1,269) | | | |
| Repairs, Maintenance &) | 2,194 | | |
| Insurance £314) | | | |
| Office Expenses— | | | |
| Furniture & Equipment | 435 | | |
| Postages £297; Printing,) | | | |
| Stationery & Advertising £924;) | 1,947 | | |
| Telephones £726) | | | |
| Other Items | 93 | | 4,669 |
| Total—GENERAL ADMINISTRATIVE CHARGES | 7,493 | | 7,493 |
| GENERAL | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works (For details see Table 4) | — | | — |
| Carried forward | — | | — |
| Carried forward | 140,454 | 8,683 | 149,137 |

Loan and Revenue Accounts—Continued
Continued

| | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-------------------------|----------------------|---------------------|
| INCOME | | | |
| Brought forward | 39,472 | 7,300 | 46,772 |
| GENERAL ADMINISTRATIVE CHARGES | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works | — | — | — |
| Revenue Transactions:— | | | |
| Allocated to Main Services, etc., | | | |
| Water Resources | 2,950 | | |
| Land Drainage | 2,271 | | |
| Fisheries & Water Recreation ... | 1,207 | | |
| Pollution Prevention | 1,065 | | 7,493 |
| Total—GENERAL ADMINISTRATIVE CHARGES | | | |
| | 7,493 | | 7,493 |
| GENERAL | | | |
| Capital Transactions:— | | | |
| Non-Grant Aided Works | — | — | — |
| Carried forward | — | — | — |
| Carried forward | 46,965 | 7,300 | 54,265 |

Statement of Income and Expenditure on
TABLE 2—

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|------------------------|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| EXPENDITURE | | | | | | | |
| Brought forward | ... | ... | ... | ... | 140,454 | 8,683 | 149,137 |
| Brought forward | ... | ... | ... | ... | — | | — |
| Revenue Transactions:— | | | | | | | |
| Rechargeable Works | ... | ... | ... | ... | 2,218 | | 2,218 |
| Total—GENERAL | | | | | 2,218 | | 2,218 |
| GRAND TOTALS | | | | | 142,672 | 8,683 | 151,355 |
| | | | | | 142,672 | 8,683 | 151,355 |

Loan and Revenue Accounts—Continued
Continued

| | | | | | Revenue Account £ | Loan Account £ | Grand Total £ |
|--|-----|-----|-----|-----|-------------------------|----------------------|---------------------|
| INCOME | | | | | | | |
| Brought forward | ... | ... | ... | ... | 46,965 | 7,300 | 54,265 |
| Brought forward | ... | ... | ... | ... | — | | — |
| Revenue Transactions:— | | | | | | | |
| Rechargeable Works | ... | ... | ... | ... | 2,218 | | 2,218 |
| Precepts— | | | | | | | |
| Councils of Counties and County Boroughs (for details see Table 5) | ... | ... | ... | ... | 82,876 | | |
| Internal Drainage Boards (for details see Table 5) | ... | ... | ... | ... | 3,398 | | 86,274 |
| Total—GENERAL | ... | ... | ... | ... | 88,492 | | 88,492 |
| GRAND TOTALS | | | | | 135,457 | 7,300 | 142,757 |
| Balance—Expenditure in Excess of Income for the Year | | | | | 7,215 | 1,383 | 8,598 |
| | | | | | 142,672 | 8,683 | 151,355 |

TABLE 3

WATER RESOURCES

Particulars of Transactions during the year in respect of Capital Works

| Starting Date | Probable Date of Completion | Brief Description of Works | Total Estimated Cost | EXPENDITURE | | Total to 31st Mar. 1968 | LOANS RAISED | | |
|---------------|-----------------------------|------------------------------------|----------------------|-------------------------------|--------|-------------------------|------------------------------|-------------------------|----------------|
| | | | | During year covered by Report | | | During yr. covered by Report | Total to 31st Mar. 1968 | Source of Loan |
| | | HYDROMETRIC WORKS | | Revenue | Loan | | | | |
| | | Grant Aided Expenditure— | £ | £ | £ | £ | £ | £ | |
| | | Gauging Stations— | | | | | | | |
| March 1968 | May 1968 | River Caldew—Holm Hill | 2,688 | 700 | 700 | 1,400 | — | — | |
| Feb. 1967 | April 1967 | River Cocker—Southwaite | 2,009 | 235 | — | 2,057 | | | |
| Dec. 1967 | March 1968 | River Derwent—Ouse Bridge | 2,354 | 1,193 | 1,193 | 2,386 | 1,000 | 1,000 | PWLB |
| Oct. 1966 | Feb. 1967 | River Eden—Sheepmount | 2,718 | Cr. 69 | — | 2,698 | | | |
| June 1967 | Oct. 1967 | River Irt—Galesyke | 2,302 | 1,055 | 1,055 | 2,110 | 1,050 | 1,050 | PWLB |
| May 1967 | Oct. 1967 | River Irthing—Greenholme | 2,800 | 1,313 | 1,312 | 2,625 | 1,300 | 1,300 | PWLB |
| | | Non-Grant Aided Expenditure | | — | | | | | |
| | | Total—Hydrometric Works | | 4,427 | 4,260 | | | | |
| | | WATER CONSERVATION WORKS | | | | | | | |
| Oct. 1967 | July 1968 | Derwent Site Investigations | 78,000 | — | 27,602 | 27,602 | 20,000 | 20,000 | PWLB |
| | | OTHER ITEMS | | | | | | | |
| | | New Vehicles | | 1,243 | — | | | | |
| | | GRAND TOTAL— | | | | | | | |
| | | CAPITAL EXPENDITURE | | 5,670 | 31,862 | | | | |

TABLE 4

Particulars of Transactions during the year in respect of Capital Works
(OTHER THAN FOR WATER RESOURCES)

| Starting Date | Probable Date of Completion | Brief Description of Item | Total Estimated Cost | EXPENDITURE | | LOANS RAISED | | |
|---------------------------------------|---------------------------------------|-------------------------------------|----------------------|-------------------------------|-------------------------|------------------------------|-------------------------|----------------|
| | | | | During year covered by Report | Total to 31st Mar. 1968 | During yr. covered by Report | Total to 31st Mar. 1968 | Source of Loan |
| March 1966 Sept. 1967 Feb. 1965 | July 1967 March 1969 Sept. 1968 | LAND DRAINAGE | £ | Revenue | Loan | £ | £ | |
| | | Grant Aided Expenditure— | | £ | £ | | | |
| | | Caldew—Carlisle | 5,600 | 541 | — | 5,041 | | |
| | | Mawbray Beck | 14,349 | — | 4,383 | 4,383 | 3,000 | PWLB |
| | | Wampool—Part III | 10,667 | 1,312 | — | 10,900 | | |
| | | | | 1,853 | 4,383 | | | |
| | | Non-Grant Aided Expenditure— | | | | | | |
| | | New Vehicles | | 1,963 | — | | | |
| | | New Excavator | | 116 | 4,300 | | 4,300 | PWLB |
| | | New Tractors and Implements ... | | 4,630 | — | | | |
| | | | | 6,709 | 4,300 | | | |
| | | TOTAL — Land Drainage | | 8,562 | 8,683 | | | |
| | | FISHERIES & WATER RECREATION | | | | | | |
| | | Trailer | | 138 | | | | |
| | | Boats (Fish Disease) | | 138 | | | | |
| | | TOTAL—Fisheries & Water Recreation | | 276 | | | | |
| | | GENERAL ADMINISTRATIVE CHARGES | | | | | | |
| | | Additional Office Accommodation ... | | 2,824 | — | | | |
| | | TOTAL—Gen. Admin. Charges ... | | 2,824 | — | | | |
| | | GRAND TOTAL— | | | | | | |
| | | CAPITAL EXPENDITURE | | 11,662 | 8,683 | | | |

TABLE 5
PRECEPTS ON (a) COUNCIL AND COUNTY BOROUGH AND
(b) INTERNAL DRAINAGE BOARDS

| | | | | Acreage within River Authority Area | Appropriate Penny Rate Product £ | Amount of Precept £ | Proportion of Precept Relating To the Water Resources Account Expenditure | Equivalent Rate in the Pound |
|-------------------------------|-----------------------------|-----|-----|---|---|------------------------------|---|------------------------------------|
| (a) County Councils: | | | | | | | | |
| | Cumberland | ... | ... | 882,105 | 41,140.0 | 89,272 | | |
| | Westmorland | ... | ... | 237,066 | 2,380.0 | 5,165 | | |
| | Northumberland | ... | ... | 12,480 | 27.3 | 59 | | |
| | North Riding of Yorkshire | ... | ... | 512 | — | — | | |
| | | | | 1,132,163 | 43,547.3 | 94,496 | | |
| County Borough Council: | | | | | | | | |
| | Carlisle | ... | ... | 6,092 | 13,287.0 | 28,832 | | |
| | TOTALS | ... | ... | 1,138,255 | 56,834.3 | 123,328 | 32.8 | 2.17d |
| (b) Internal Drainage Boards: | | | | | | | | |
| | Allonby Bay and River Ellen | | | | | 827 | | |
| | Brunstock Beck | ... | ... | | | 123 | | |
| | River Marron | ... | ... | | | 51 | | |
| | Upper Derwent | ... | ... | | | 735 | | |
| | Waver and Wampool | ... | ... | | | 1,662 | | |
| | GRAND TOTAL | ... | ... | | | 126,726 | | |

TABLE 6
INCOME FROM DRAINAGE CHARGES
NONE

TABLE 7
LOAN STATEMENT

| | Water Resources £ | Other than Water Resources £ |
|---|-------------------------|------------------------------------|
| (a) Loan Raised and Repaid during the year: | | |
| Total loans outstanding at beginning of year—1st April, 1967 | — | 146,846 |
| Add—Loans raised during the year (for details see Table 3 & 4) | 23,350 | 7,300 |
| | <u>23,350</u> | <u>154,146</u> |
| Deduct—Principal repaid during the year | — | 13,736 |
| | <u>23,350</u> | <u>140,410</u> |
| Total loans outstanding at the end of the year—31st March, 1968 | | |
| | <u>23,350</u> | <u>140,410</u> |
| (b) Sinking of Redemption Funds | None | |

TABLE 8
CONTRIBUTIONS TO INTERNAL DRAINAGE BOARDS
NIL